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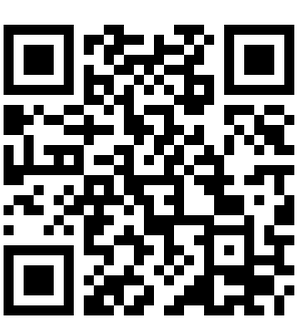

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

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EYRE SYSTEM OF LIQUID FUEL BURNING.

In view of the remarkable development in the application of oil fuel which has taken place as a direct result of the coal trouble, a system of liquid fuel burning which for efficiency and economy is claimed to be a distinct advance in its method of heat generation should be of special interest to our readers. The high cost of both material and labour with which we are faced compels consideration of any method of working that gives reasonable promise of economy, for therein alone lies the hope of progress. The system which is here described has been in use for a number of years at the works of the Eyre Smelting Company, of Merton Abbey, London. It incorporates the "Hoveler" patents of which the company are the proprietors, and differs from the usual type of sprayers, inasmuch as the liquid fuel does not enter the furnace as such, but is gasified before being projected into the furnace and a controllable flame, easily ignited, is obtained.

The system is extremely simple and suitable for all kinds of furnace work and steam raising purposes. It is a complete burner in itself and permits the use of any quality of fuel oil without carbonisation taking place. It can be fitted to any boiler or furnace without structural alterations. It is especially suitable for Lancashire (Fig. 1) or similar boilers, as it requires no brick lining to the furnace; therefore the whole of the furnace on cylindrical longitudinal boiler flues becomes a highly efficient heating surface, resulting in increased evaporation per unit of fuel and in the capacity of the plant.

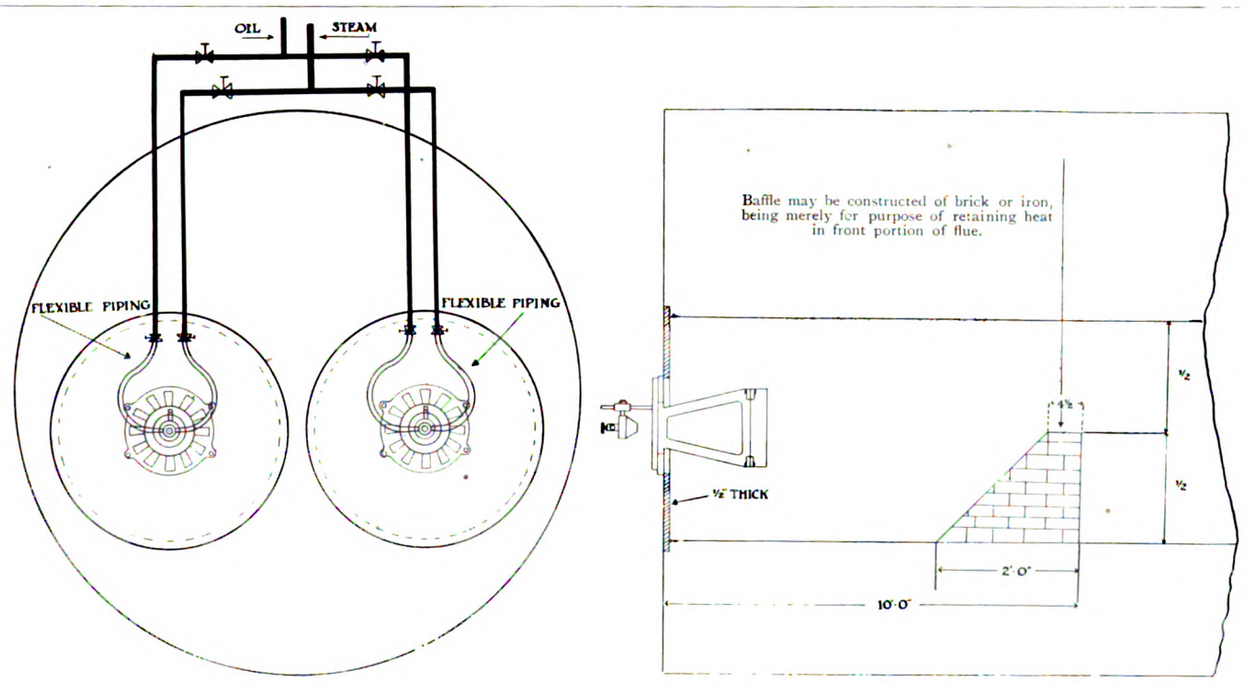

Fig. 1 —Eyre Burner as fitted to Lancashire Boiler with Steam Operation.—Note Disc Air Inlets.

The burners are made for working with steam or compressed air as the atomising agent and, in conjunction with an improved furnace front, which has been specially designed for the purpose, three alternative methods of firing are made possible—(*a*) With coal alone, (*b*) coal augmented with oil, and (*c*) oil alone. Fig. 5 is from a drawing showing the complete installation as arranged for compressed air working, while the details of the burner are shown in Figs. 2, 3 and 4. Fig. 2 represents the atomiser, the purpose of which is to disintegrate the oil and form a spray with the compressed air. It is connected with the double capsule shown in Fig. 3 by a sliding fit and can therefore be readily removed for inspection. The function of the capsule is to add air to the atomised fuel in such a

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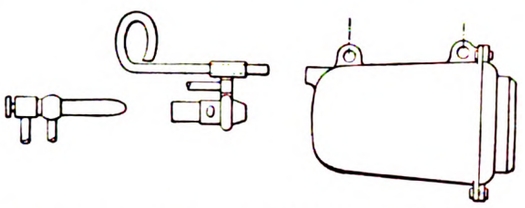
manner that the supply can be regulated so as to produce a combustible mixture of carbon and oxygen in the proper proportion. The mixture of oil and air is then introduced into the gasifier shown in Fig. 4, where it can be brought to a temperature about the flash point of the oil by a piece of burning rag or cotton-waste placed between the atomiser and the gasifier, so that at the outlet of the gasifier there will be a



Figs. 2, 3, 4.—Details of Burner for Working with Compressed Air.

directly combustible gas which can be ignited in the same way as the oil, when it will automatically continue to burn. Ignition is instantaneous and as the supply of oil and air are increased, the intensity of the flame is also increased.

Complete control of the furnace is maintained by means of the milled screws on the end of the atomiser. The highest possible temperature can be obtained and so perfect is the control that it is easily possible to keep the contents of a furnace containing molten metal continuously at a fixed temperature with exact precision.

As the apparatus supplies a directly combustible

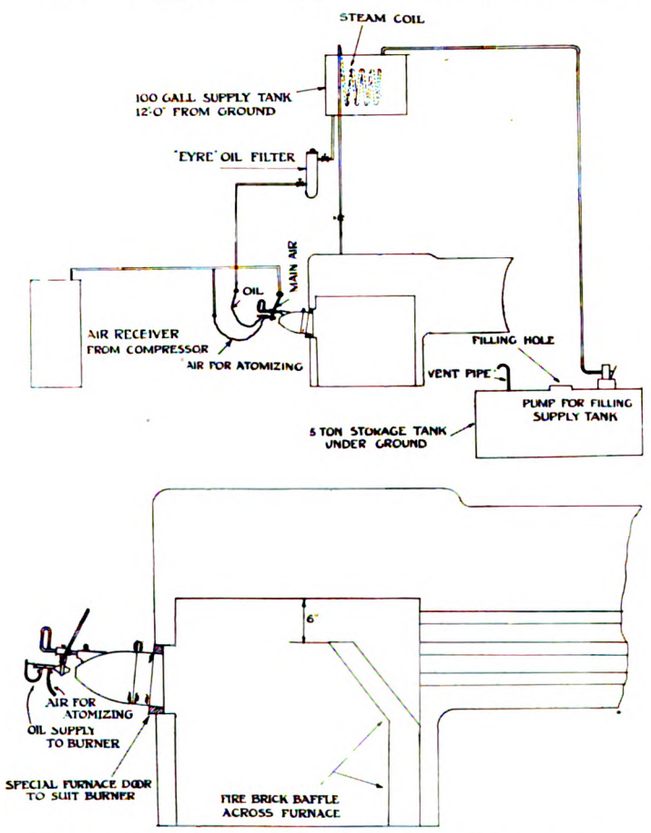


Fig. 5.—Complete Installation for Compressed Air Working.

gas it will at once be seen that it is applicable to many purposes beyond that of steam raising, and we are informed that at the works of the Eyre Smelting Company, at Merton Abbey, about 20 different fires are kept more or less in continuous operation. Amongst these are some which have been working for over 12 months uninterruptedly, the only replacement found necessary being the fireclay lining at the end of the gasifier. This is easily replaced by exchanging the firebrick ring fitted into the front part of the gasifier for a new one. Perhaps the strongest evidence that there is no possibility of leakage of oil from the burner, and that the whole of the fuel is consumed in the form of gas, is the fact that for some years past the Eyre burner has been used in India for the purpose of drying tea.

The burner operated by steam pressure, shown in Figs. 1 and 6, is similar to the air burner. It consists,

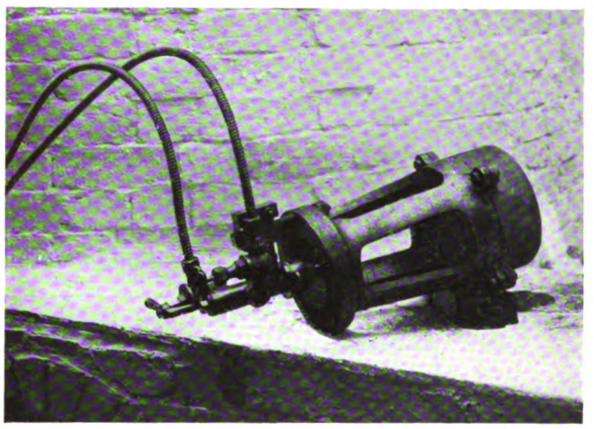


Fig. 6.—Complete Burner for Working with Steam.

however, of only two parts, the sprayer and the gasifier. The function of the former is to atomise the liquid fuel by means of steam which is led to the mouth of the sprayer at a pressure of from 40 lbs. to 50 lbs. The flow of the oil is by gravity from the oil tank, a fall of 12 ft. being recommended. Air inlets, regulated by means of a disc, accurately control the air supply. The mixture of air and fuel passes through the igniter and is there ignited in a similar manner to that already described. The resultant flame can be made several yards long should the space in the boiler or

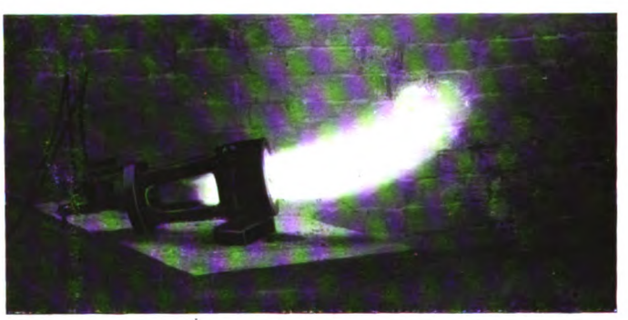


Fig. 7.—From Photograph Showing Flame at Half Pressure.

furnace be sufficient for the development of such a flame. Two illustrations, Figs. 7 and 8, give some idea of the dimensions of the flame under half and full pressure. Beside regulating the size of the flame, the intensity can also be varied.

A conception of the possibilities of the Eyre system will be gathered from the fact that a record has recently been created in the metal world by smelting and refining copper with oil. This remarkable feat was accomplished

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in the record time of 11 hours—the charge being 14 tons—against the past record of 24 hours with coal.

The Eyre Smelting Company are now one of the largest manufacturers of oil fuel burners, and anticipate a great expansion in the use of their system in the near future.

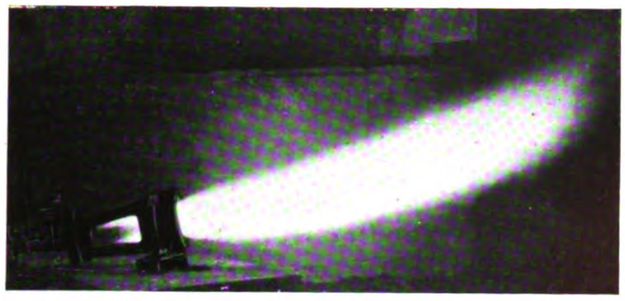

Fig. 8.—Flame at Full Pressure.

ELECTRIC SHUNTING LOCOMOTIVES.

(By a Correspondent.)

It is now some considerable time since the electric locomotive was introduced into the shunting yard, and the advantages and economies to be obtained therefrom have been amply proved and are well known. Nevertheless, progress in this country has been slow, not because of the lack of suitable material, but rather owing to a reluctance to part with a system with which all parties were familiar. Further, the actual costs of shunting operations were seldom kept separately, and in consequence the possibilities of economy were not appreciated. The present high prices of fuel, materials, and labour have served to draw attention to every channel of expenditure, and as a result the cost of yard operations has been realised in many cases for the first time.

Apart from the question of fuel and maintenance charges, which will be examined later, the electric locomotive has certain inherent advantages for this class of work. It is simple in operation, the actual machinery requiring none of the driver's attention. It is instantly ready for work at all times, requiring the minimum of attention outside working hours, and is not subject to the periodical lie-offs for boiler cleaning and repairs which are necessary with the steam locomotive. Add to this that owing to its uniform torque the electric locomotive is more powerful, weight for weight, than a steam locomotive, and can accelerate a load more quickly, and it becomes evident why in all electrification schemes it has been found possible to do more work with fewer locomotives.

The steam shunting locomotive is notoriously inefficient. Considered purely on its merits as a steam engine, and without reference to the work on which it is engaged, the fact that it is non-condensing tells heavily against it. Even under the best conditions of continuous full load it burns at least twice as much coal per horse-power hour as a turbo-generator of moderate size. It must be remembered, however, that a shunting locomotive usually works under very poor conditions. Even a hardly worked shunting locomotive stands idle for approximately half its time, although it must always keep steam for full load. Further, the service is so intermittent that at each start steam is admitted to cylinders which have had time to cool; also, in order to obtain a sustained tractive effort at low speed the valves must be set for late cut off. It is not generally realised how very little useful work is done by a shunting locomotive, but it is doubtful if its average horse-power output over the day exceeds 10 per cent. of its nominal rating.

In the case of the electric locomotive, it may be said that there are no stand-by losses. Power will usually be obtained from a supply undertaking or from some large generator working on other loads, and the power taken by any one locomotive will always be a small part of the total load on the generator; also, owing to the diversity of the load, the temporary overloads on any part of the system will not overload the generator, as they will not all occur at the same time. In many cases power is now generated from the waste heat of some manufacturing process, surely a sufficient reason in itself for superseding the coal burning locomotive by the electric.

With regard to the question of driving, the electric locomotive is very simple and easily handled. One man only is required per locomotive, and owing to the fact that there are no parts of the apparatus which require his attention while running, he can concentrate altogether on the control of the locomotive and its load. The locomotive is always ready in the shed first thing in the morning, and there are no additional labour charges for lighting up and raising steam. Shed cleaning charges will also be considerably lower, and it may be pointed out that the locomotive may be housed in any convenient shed without any danger of fire.

On the question of maintenance, the electric locomotive has proved itself definitely superior to the steam locomotive. Against boiler renewals and the upkeep of a complicated, if familiar, system of cranks and valves involving many bearings, rubbing surfaces, glands and joints, we have to set the maintenance of two simple motors and gears, a controller and a current

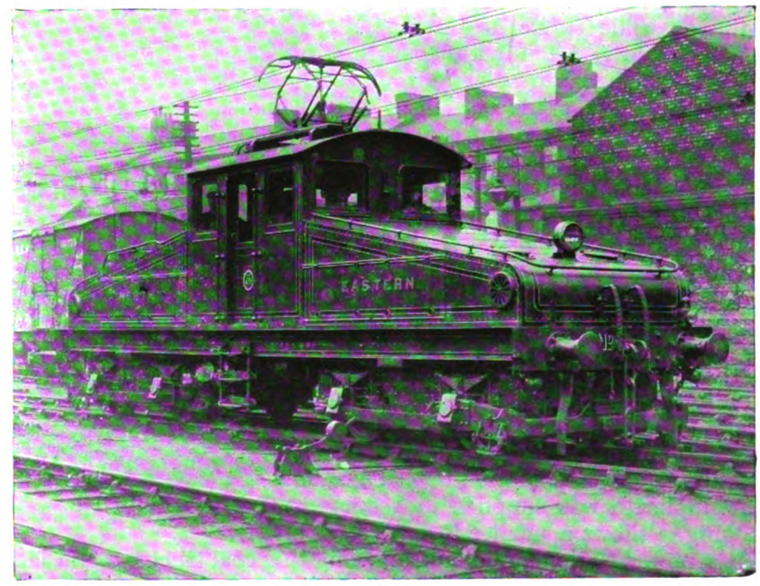

Fig. 1.—Electric Shunting Locomotive at Newcastle, supplied in 1906.

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collector and one or two switches ; the renewable parts for these are small and inexpensive. The cost of maintenance of an electric locomotive has been found not to exceed one-third of that of a steam locomotive of equal capacity.

The prospective user of electric shunting locomotives need have no fears as to the reliability of the material. Almost all the tramways, and many of the electric railways in this country, were equipped from fifteen to twenty years ago, and the original equipments are still running under conditions which have steadily grown more severe. Present day equipments show marked improvements even on those, both in the quality of material and in design. The illustrations show three of the many types of electric shunting locomotives which have been supplied by the British Thomson-Houston Company, Limited, of Rugby.

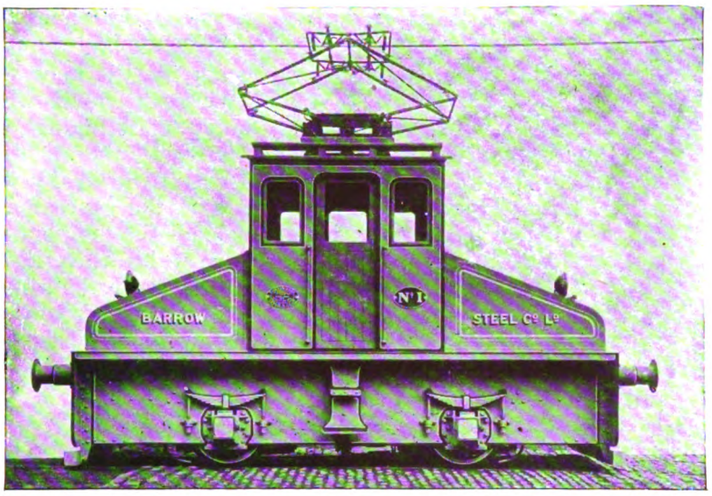

Fig. 2.—Electric Shunting Locomotive at Steel Works.

Fig. 1 shows one of two shunting locomotives supplied in 1906 to one of the home railway companies. These locomotives, which weigh 56 tons, are handling the quayside traffic at Newcastle. Each locomotive is fitted with four motors of 90 H.P., which can start a train weighing 160 tons on a grade of 1 in 27, and haul it on this grade at 10 miles per hour. They operate at 550 volts on either a third rail or overhead conductor. Air brakes are fitted supplied with air by a motor-driven compressor controlled by an automatic governor.

Fig. 2 shows a 22-ton locomotive supplied to a large firm of steel makers in 1914. It is operated with current at 500 volts from an overhead conductor, and is fitted with two motors at 85 H.P. It is employed in hauling slag on a grade of 1 in 20, and is equipped with the same system of air brakes as the locomotive described above. A duplicate was supplied in 1916.

Fig. 3 shows a smaller locomotive in use at a power-station for hauling and shunting coal trucks. It weighs 10 tons, and is fitted with two 26 H.P. motors.

With regard to the system of distribution, there can be little doubt that power at 500-600 volts D.C. collected from an overhead conductor or trolley line is the best for a private shunting yard electrification, and this voltage is usually obtainable without the necessity of laying down converting plant. Further, this voltage being a standard for tramway and railway work, there is a big selection of standard and well-tried apparatus from which to choose.

The overhead system is the most generally suitable, although it may be necessary in certain circumstances to leave gaps in the line for the passage of cranes. If the arrangement of the track is such that the gap would seriously interfere with the efficient working of the locomotive, it would be possible to arrange a short length of third rail at this point which should only be alive when the train was passing over. Failing this, a small battery could be carried on the locomotive of sufficient capacity to carry it over this dead section.

An aspect of the matter upon which there is some misconception is the application of storage batteries to electric locomotives. Electric battery locomotives have shown very real economies in some specialised fields. For instance, in the case of mines where a trolley wire is sometimes inadmissible, or for handling contractors' railways, where the run of the track is being altered from day to day. In these instances the locomotives have been extremely successful, and there is every reason to believe that at an early date they will completely supersede the costly system of haulage by man power or animals. They have also been used to a considerable extent in workshops for the same reason. In some cases, too, where the traffic is very light and the yard extensive, it may not be economical to instal an overhead conductor line, but such conditions do not often occur in ordinary shunting practice, and in the majority of cases it is certain that the battery system cannot compete with a system drawing its power from an overhead line. Apart from the disadvantages which are inherent in storage batteries, such as limited capacity and inability to meet prolonged overloads, periods of idleness during charging and labour charges in connection therewith, it must be realised that the life of a battery is comparatively short.

Fig. 3.—Electric Shunting Locomotive at a Power Station.

The average life of a battery varies with the type chosen and the care taken in its use and maintenance. In most cases the makers are prepared to guarantee for a certain period, subject to certain conditions being

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observed. This period is usually very near to the useful life of the battery, and in making estimates for the cost of a conversion from steam to battery locomotives the life of the battery should be estimated as the length of the guarantee period. After this, or shortly after this, a new battery will be required, less a small percentage for the scrap value of the old one. This, together with the increased cost of battery attendance, adds a very considerable sum to the yearly maintenance charges. These figures should be gone into very carefully for each proposition, the extra cost and maintenance of the battery being balanced against the cost and maintenance of an overhead conductor. The cost of maintaining a mile of single overhead, together with the track bonding, should not exceed £100 per annum at present day values, and will probably be considerably less. Enough has been said to show that in cases where it is impossible to fix an overhead or third rail, the battery locomotive may be able to effect a considerable saving on haulage by steam locomotives, but that it cannot compete with an overhead conductor system as regards maintenance costs or convenience of operation.

In conclusion, it would appear that under the conditions obtaining to-day, when it is so necessary to prevent any waste of either labour or material, users of steam shunting locomotives would find it to their advantage to consider very carefully the conversion to electric working.

GLASGOW TRAMCAR ACCIDENT.

Derailment at Dangerous Curve.

An accident which caused injuries to some 15 people occurred on the Glasgow Corporation Tramways on Monday afternoon, June 27. A car laden with 18 people, including the driver and conductor, was proceeding down the steep decline of Bilsland Drive, Maryhill, when it got out of control, left the rails at a sharp curve near the canal bridge, and crashed into a trolley standard at the side of the road. Only three of the occupants escaped injury. Some were only slightly hurt, but others remained at the Infirmary for treatment. The driver, James Gilmour, aged 25, suffered a fracture of the right leg.

Derailed Glasgow Corporation Car Cut Into by Tramway Standard.

Very fortunately the trolley standard, though bent, remained in the ground, and cut a way through the front of the car as far as the forward door, which was smashed. Wedged here, the standard prevented the car from overturning, a contingency which would have involved more serious consequences. The scene of the accident has always been regarded as a dangerous spot. An accident occurred there some four years ago, when a car overturned and several people were injured. The Tramways Department had instituted a compulsory stop immediately above the turn on the downward line, but it is presumed that on the present occasion the car failed to respond to the brakes.

When Liverpool Corporation Bill came before the local Legislation Committee of the House of Commons, the Ministry of Transport asked that the powers sought in respect of omnibuses should be clearly defined. Mr. Thomas, K.C., for the Corporation, said there was no doubt that the powers were limited to operation within a radius of 12 miles from the old city boundary, and the clause was agreed to.

Electric Traction in Western Australia.—The surveyor to Perth Town Council mentions that in consequence of the ever increasing cost of petrol and its substitutes, of coal for steam traction, and of the heavy expense of horse maintenance, the question of converting and extending the Council's mechanical transport from high combustion engines to electric traction requires careful consideration especially in view of the fact that the Council can supply its own current.

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Readers may be unable to obtain copies of THE TRAMWAY AND RAILWAY WORLD unless a definite order be given in advance. Those who order copies in this way from newsagents and experience any difficulty in obtaining them should communicate with us.

THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, JULY 14, 1921.

Omnibus Licences.

Since 1916 the Highways Authorities of the country have been empowered under Section 20 of the Local Government (Emergency Provisions) Act to withhold licences in respect of any new omnibus routes. This enabled them to minimise waste by refusing to licence additional transport undertakings where adequate facilities already existed. On the setting up of the Ministry of Transport, the position was somewhat modified by the introduction of a right of appeal. In the event of an application being refused, the matter could be taken before the Minister, who, if he found necessary, could make an order requiring the local authority to grant the licence in question. That has been the situation for the past two years; local authorities who have been able to show the already existing transport facilities, either by tramcar or omnibus, to be sufficient to meet the demand have not been obliged to grant licences to would-be competitors to ply for hire along the same routes. Important changes are, however, now imminent. With the expiry of the Emergency Act which takes place on August 15, in accordance with the general movement towards decontrol and free competition, it will no longer be possible for Highway Authorities to refuse to grant applications by reputable undertakings possessing serviceable vehicles. This presents municipal and privately-owned tramway systems alike with a very serious problem. They will become subject to competition by vehicles running along their routes but capable of being diverted on special errands or to special districts which the fluctuation of traffic may suggest. Such services if well handled may easily prove more convenient for individual passengers by offering through travelling, possibly more rapid travelling, by filling up with passengers going all the way and so minimising stops. While patently incapable of dealing with the whole or even a large proportion of the traffic in any locality without hopeless congestion in the streets, such undertakings are quite likely for the reasons above stated to take away from the existing tramway systems a certain number of passengers. This may suffice to ensure a profit on a small number of vehicles, and so keep the new undertakings in existence, while the loss of patronage if not fatal to the equilibrium of the tramway balance sheet will at least cause serious embarrassment with the present charges for fuel and labour. Free-lance competition of this character by the "jitney" of America was there found to be very prejudicial to tramway interests, and for a time threatened to ruin them. Street congestion due to the existence of such an extraordinary number of small free running vehicles rapidly reached a pitch hitherto unknown in this country; while from another direction, to which frequent reference has been made in these pages, efforts that have achieved a large measure of success were made to meet the situation. As is well known, the large car on the tramways has been supplemented by a frequent service of one-man safety cars. Small size enables shorter headway and much greater speed between stops to be attained, and the safety devices, while reducing platform accidents to a remarkable extent, have made possible the reduction in working costs consequent upon the elimination of the conductor. Whether similar means will be adopted to meet the case in this country remains to be seen; but these or some substitute will have to come, for the number of passengers that has to be handled cannot be

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successfully dealt with by small free running vehicles alone. For large towns the tramcar will remain a necessity, and in one way or another must be preserved as a solvent industry.

Disabled Men as Drivers.

A decidedly harmful suggestion has been made by a London morning newspaper—one that may involve disappointment and waste of time on the part of men disabled in the war. In commenting upon a demonstration given in Richmond Park of "modifications enabling motorists partially disabled by injuries received in the war to control vehicles with skill and safety," the journal in question expressed the opinion that "there ought to be no insuperable difficulty in so altering the mechanism of public vehicles on the lines of the exhibits shown at Richmond, so as to give disabled men another avenue by which to earn a livelihood." Before stating the objection to the introduction of maimed men to public conveyances, it may be useful to glance at the innovations to which our contemporary refers. The devices are applied chiefly to enable cars to be driven by men minus one or both feet or who have only one arm. A noteworthy device is a combination of the clutch and foot brake, the clutch being operated by half pressure of a lever, while full pressure brings the brake into action. Only private cars were shown with the altered arrangements, and the reports of the proceedings do not credit the society concerned with any desire to bring heavy public vehicles or even taxicabs into the scope of their operations. The organisers are wise in their moderation, for although a cab on pneumatic tires can be steered by one hand at a pinch, a six-ton omnibus on solid tires requires great physical strength for steering, and it is impossible to make a turn of the wheel without the use of both hands. Moreover, the licensing authority deems it essential that every licensed driver should be capable of starting his engine, as dislocation of traffic would result in the event of involuntary stoppage. Besides, the work of cranking an omnibus or lorry engine needs great strength and skill to enable one man to perform it. Above all other considerations there is one that irrevocably bans the employment of a disabled man as a driver. It is that of the public safety, and every one ought to be aware that two Committees appointed by successive Home Secretaries since January, 1916, have on that all-sufficient reason declined to take the responsibility of recommending any concession to disabled men.

Street Traffic Regulation.

While it has not yet been found possible, even with the good offices of the Ministry of Transport, to set up an authority to deal with the public passenger traffic of London on the lines of co-ordination, there are non-contentious matters demanding attention without delay. These desirable reforms relate to the regulation of road traffic generally, and it is satisfactory that there are clear indications that action will be taken in the comparatively near future. Such action will be the outcome of the interest which the London Members of Parliament have for two years past been manifesting in the traffic of the Metropolis. At the invitation of the Parliamentary Secretary of the Ministry of Transport the Members referred to have been considering the preparation of a non-contentious Bill dealing with urgent requirements, and they in turn have secured the aid of a small committee composed of one representative each of the County Council, the Borough Councils, the Greater London authorities, and the London Members, with a representative of the Ministry of Transport. Their task is to draft improvements to the existing by-laws now administered by the police for the Home Office. When the additional by-laws have received the approval of the Ministry of Transport the alterations will be submitted to the Home Office. The necessary Bill would then be introduced by the Minister with the support of the Home Secretary. The changes likely to be proposed should prove of benefit to the operators of all public service and motor vehicles generally. For instance, the by-laws will deal with the position in the streets of slow and fast moving traffic and the relegation of specific traffic to certain thoroughfares. Hitherto efforts made to deal with slow traffic by a by-law obtained by the County Council in the interest of their tramway passengers have not proved altogether effective, and on that account the Transport Ministry and the police have not approved of an effort made by other Metropolitan tramway authorities to obtain a

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similar regulation. The relegation of specific traffic to certain thoroughfares has become desirable owing to the increasing preponderance of motor traffic. In the narrow streets of the City of London, too, the motor omnibus led to the Corporation obtaining powers from Parliament to set apart certain thoroughfares as one-way routes. Other matters to be dealt with by the proposed Bill include frontage obstruction through the loading and stationing of vehicles, the parking of cars in the squares, and various other aspects of obstruction. From this outline of the proposals it will be seen that the new by-laws are deserving of support in the public interest. Inaugurating, as the new by-laws would do, a new era in the annals of mechanical traction, their successful operation would soon lead provincial centres to apply for similar powers, and it is to be hoped that they will not have to waste money on an Act of Parliament to obtain them.

Tramways on Main Roads.

The allusion to tramways on main roads by Lord Montagu in a series of articles which he has contributed to *The Times* on road reform is a singular instance of one-sided vision. He complains, with some justification, of the unsatisfactory and sometimes dangerous state of certain sections of track near the towns, particularly on one of the main roads to London, and proceeds—"Of course tramways on main roads are an anachronism, and these light railways, for they are nothing else, should purchase wherever possible, as other light railways do, their own land for permanent way, or else where there is room put their tracks on the edge of the main roads, leaving the road surface undisturbed." We are not unmindful of Lord Montagu's valuable pioneer work in connection with road transport, but the suggestion quoted above is not a practical proposal in the majority of cases. There is a tendency for those who are concerned primarily with motor traffic on main roads to look askance on anything that does not give way to them. Motor users should, however, remember that tramways are usually the property of local ratepayers, for whom they form an essential means of daily conveyance. The main thoroughfares to and through a town serve not only as connecting links with other parts of the country; it is along them that many local residents have to journey to business, and their only means in a large proportion of cases is the tramway car. This is especially the case where the suburbs of a big town lie out along the main roads. The very fact that it is frequently only these roads which are sufficiently wide to accommodate tramway tracks is one reason why the lines are there. If motorists want roads for their sole use, they are at liberty to construct them. No one regrets the presence of an unsatisfactory stretch of car line more than the tramway managers themselves, who know only too well what a strain on their rolling stock such a state of affairs involves. These defects are largely due to arrears of maintenance from war time, and anyone who follows tramway matters is aware of the efforts being made all over the country to make good the leeway. Lord Montagu adds that "some comfort may be derived from the fact that in the present bad financial state of tramways generally no extension of their tracks on the roads is likely to take place." A little reflection would have shown that this very reason, combined with the costliness of track reconstruction, may account for much of the delay in putting tracks in order. However desirable it may be to have clear and undisturbed main roads, we suggest that so far as the towns are concerned, the interests and convenience of the local community must have first consideration.

TRAMWAYS AND OIL FUEL.

Since the publication in our issue of June 16 of an article on oil fuel installations in tramway power-houses, further details have been received concerning the oil fuel plant installed at the Greenwich generating station of the London County Council Tramways. Four Babcock and Wilcox land type boilers, each of 4,780 sq. ft. heating surface, have been converted to the use of oil fuel. The Wallsend-Howden pressure system has been adopted, and the change over from coal to oil burning was carried out by the Council's own men. The plant has worked satisfactorily since its installation. The chief advantages in the use of oil fuel are found to be the flexibility of the system, enabling peak loads to be easily handled, and the absence of ash. Its permanent use by the County Council will, of course, depend on the relative prices of coal and fuel oil in the future.

An order has been placed with the Wallsend Slipway and Engineering Company for the greater part of the oil burning plant, the cost of which amounts to £2,800. It is estimated that the total cost, including provision of the necessary pipe line, would be about £4,200.

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WAGES SETTLEMENT.

REDUCTION BASED ON COST OF LIVING.

The following statement by the National Joint Industrial Council for the tramway industry was issued on June 16. The report of the Court of Inquiry to which reference is made was given in our issue of March 17.

COURT OF INQUIRY.

We are directed to inform you that at a meeting of this Council held to-day at the Ministry of Labour, the Special Committee appointed on April 28 last to consider and report upon the report and recommendations of the recent Court of Inquiry (which committee has held five meetings) was submitted, and approved by the Council with only one dissentient.

The report upon the second recommendation of the Court of Inquiry was in the following terms—

(*a*) That the present rate of wages should be maintained until the commencement of the first full pay period in August, 1921.

(*b*) That on and from the commencement of the first full pay period in August, 1921, reduction from, and additions to, wages shall be at the rate of 1s. (one shilling) per week for each complete five points' variation either way in the cost of living index figures,* commencing from the figure of 135 per cent. over the August, 1914, cost of living.

(*c*) That thereafter, the adjustment of wages shall be regulated every three months.

(*d*) That the first adjustment of wages in August, before referred to, shall be determined by the cost of living index figure as published in the July *Labour Gazette*, and thereafter by the index figure as stated for the month preceding each subsequent adjustment.

(*e*) Alterations in the rates of wages of employees under 18 years of age shall be regulated in accordance with the provisions of this agreement, with the exception that reductions from, or additions to, wages shall be at the rate of 6d. (sixpence) per week for each complete five points variation.

(*f*) That this arrangement shall be terminable by three months' notice in writing from either side, but no such notice shall be given before December 31, 1921.

(*g*) The methods of calculating payment of wages shall be the same as are now in operation in the various undertakings.

(*h*) In the case of any undertaking, where the total war wage increase of 40s. (exclusive of basic rate increase) is not now being paid, no reduction in wages shall operate on such undertaking until the rate of increase is equal to the current general increase obtaining in the industry.

(*i*) The joint secretaries shall issue to the parties concerned prior to such periodical regulations of wages, the cost of living index figure as published in the *Labour Gazette*, together with a statement showing the amount of wages adjustment required to be made under this agreement.

We are directed to ask you to give effect to this decision of the National Council.

*** The cost of living index figure referred to in the foregoing recommendations refers to the "all items included" figure published in the *Labour Gazette*.**

In due course you will receive a statement of the wages adjustment to be effected "on and from the commencement of the first full pay period in August, 1921."

The report of to-day's proceedings of the Council will be issued shortly.—Yours faithfully.

J. BECKETT,
J. CLIFF,
A. DE TURCKHEIM, } *Joint Secretaries of the Council.*

5 and 6, Clement's Inn, Strand,
London, W.C.2.
June 16, 1921.

MANUAL OF ELECTRICAL UNDERTAKINGS.

[Manual of Electrical Undertakings and Directory of Officials, 1920-1921. Compiled under the direction of Emile Garcke, M.I.E.E., F.S.S. Vol. xxiv. London: Electrical Press, Ltd. 30s. net.]

It would be impossible to speak too highly of this indispensable handbook of the electrical industry, which is now in its twenty-fourth volume. Since its first appearance, Mr. Garcke's substantial publication has been regarded as the "official" guide to electric lighting, power, and traction works and the industries on which they rely. The character of the volume is too familiar to need detailed analysis here, but attention may be drawn to the useful and copious statistics which preface the work. These relate to about 2,760 electrical concerns, as compared with the 200 dealt with in the first volume published in 1896. The aggregate subscribed capital in shares, debentures, and loans of the traction undertakings dealt with amounted in 1920-21 to £181,875,591 for 155 companies, and £67,424,937 for 168 municipalities, the latter figure including loans authorised. The total subscribed capital for all classes of electrical undertakings, numbering 1,374, was £541,862,988, as compared with £508,979,037 for the previous year.

The great majority of the sixteen hundred pages are, of course, occupied by details of each separate undertaking throughout the Empire, conveniently arranged and indexed. The directory of officials now contains about 20,000 names and addresses. Of the large selection of admirable maps which is, as usual, incorporated, a special feature this year is the series of 13 maps showing the areas of the Electricity Districts provisionally determined by the Electricity Commissioners. For the convenience of those requiring quotations, the classified buyers' directory supplies very full information.

GLASGOW CORPORATION TRAMWAYS.

A SURPLUS OF £105,000.

In our issue of June 16 some traffic and other statistics of the Glasgow Corporation Tramways for the year ended May 31 were given. Fuller information has since become available, and a summary of the accounts for the last year compared with the previous year is given below—

Year ended May 31.	1921.	1920.	1919.	1917.
	£	£	£	£
Traffic receipts	2,388,444	1,716,491	1,527,488	1,245,507
Sundry receipts	4,410	5,087	3,832	14,607
Total revenue	2,392,854	1,721,578	1,531,320	1,260,114
Traffic expenses	1,018,501	856,111	674,664	395,736
General expenses	254,573	225,872	174,508	137,816
Maintenance and repairs	462,000	317,521	219,509	143,758
Power expenses	199,517	152,742	106,686	67,231
Clydebank bridges	2,475	2,314	1,753	879
	1,937,066	1,554,560	1,177,120	745,420
European War	599	3,601	72,869	92,645
Total expenditure	1,937,665	1,558,161	1,249,989	838,065
To net revenue account	455,189	163,417	281,331	422,049
Interests on investments	15,240	13,345	10,565	78,637
Total	470,429	176,762	291,896	500,686
DEDUCTIONS—				
Rent of Paisley lines	15,722	11,093	9,755	8,453
Interest on capital	6,926	3,892	—	78,846
Sinking fund	2,674	1,715	—	114,378
Income tax	70,813	81,295	83,702	64,622
Parliamentary expenses	811	1,056	124	98
Renewal and depreciation	267,687	186,242	183,543	73,305
Total	364,633	285,293	277,124	339,702
Surplus	105,796	—	14,772	160,984
Deficit	—	108,531	—	—

The surplus has been applied to the reduction of the deficit of £108,531 of the previous year, leaving a debit balance of £2,735.

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MUNICIPAL TRAMWAY MANAGERS' CONFERENCE.

INTERESTING TOURS OF INSPECTION.

We are indebted to Mr. A. A. Blackburn, general manager of Huddersfield Corporation Tramways, for the following record of the tours of inspection in which the tramway managers took part who attended the annual meeting of the managers' section of the Municipal Tramways Association at Huddersfield on June 22 and 23.

Municipal Tramway Managers at Karrier Motor Works, Huddersfield.

The discussions of the conference were mainly devoted to railless trolley vehicles and motor omnibuses; but as the proceedings were as usual conducted in camera, no report is available.

On the Wednesday the managers were welcomed in the Council Chamber of the Town Hall by Alderman E. H. Sellers, chairman, and the members of the Tramways Committee. After the conference the members were entertained to luncheon in the Masonic Hall by the Mayor, Alderman J. A. Woolven, and the Corporation. Later in the afternoon two motor coaches and an exhibition motor omnibus supplied by Karrier Motors, Ltd., conveyed the members to the tramway depot, Longroyd Bridge, where the latest type of tramcar, motor omnibus, overhead tower wagon, and coal haulage trucks were inspected. (These vehicles were illustrated in our issue of June 16.) Subsequently the party visited the premises of Karrier Motors, Ltd., which adjoin the new car depot, where a railless vehicle of Leeds Corporation Tramways, which is approaching completion, was inspected.

On Friday morning several of the members visited the works of J. Hopkinson and Company, Birkby, where various stages of valve manufacture were inspected.

A Group of Karrier Vehicles with Municipal Tramway Managers.

survey was made of their extensive works and plant. Afterwards at the entrance to the offices photographs of the party were taken. The motor vehicles then conveyed the party to High Flatts, near Penistone, to the residence of Mr. W. T. Robson, late general manager of the Southampton Corporation Tramways, where Mrs. Robson provided tea on the lawn.

After the conference on Thursday the members were entertained at luncheon by Alderman E. H. Sellers, chairman, and Councillor T. Canby, deputy chairman of the Tramways Committee. Karrier Motors, Ltd., again provided conveyances, and the members journeyed to Harrogate. En route a short stop was made near Bradford, where the latest type of railless trolley vehicle was inspected. A number of members travelled in this vehicle for several miles. Tea was provided at the Prospect Hotel, Harrogate, by the chairman and deputy chairman of the Tramways Committee. On the return journey via Knaresborough, Wetherby, and Leeds a new railless vehicle of Leeds Corporation Tramways, which is approaching completion, was inspected.

On Friday morning several of the members visited the works of J. Hopkinson and Company, Birkby, where various stages of valve manufacture were inspected.

GRANTS FOR THE ROADS.

The Minister of Transport has sent a circular to local authorities stating that, subject to his approval of the works proposed, the grants from the Road Fund during the financial year 1921-22 towards the improvement and maintenance of classified roads and bridges will be 50 per cent. of the actual expenditure in the case of Class I. roads and bridges on Class I. roads, and 25 per cent. of the actual expenditure in the case of Class II. roads and bridges on Class II. roads.

It is intended to make quarterly advances of 45 per cent. of the quarterly expenditures in the case of Class I. roads and bridges, and of 22½ per cent. of the quarterly expenditures in the case of Class II. roads and bridges. The total of the four quarterly advances will in no case exceed 90 per cent. of the grant.

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TRAMWAY TRACK MAINTENANCE.*

By Robt. B. Holt, M.I.Mech.E., M.Inst.C.E.I.

The standard of track maintenance has suffered a serious set-back in consequence of the war and its aftermath of industrial unrest, high wages, shorter working hours, and increased cost of materials.

The standard to-day on many tracks is that of over fifteen years ago, in the period before much of the original track had been relaid when "hog-backed" rails, erratic levels, faulty alignment, and badly hammered joints were the rule. In consequence of the almost entire neglect, during the war, the whole of the improvements effected during the reconstruction period have been lost; the standard has deteriorated, and as a natural consequence slower speeds and uncomfortable travelling are general. As reserve funds have vanished in most cases, and revenues do not as yet permit of an adequate amount of reconstruction, the life of track is being prolonged very considerably beyond the limit set by expert witnesses

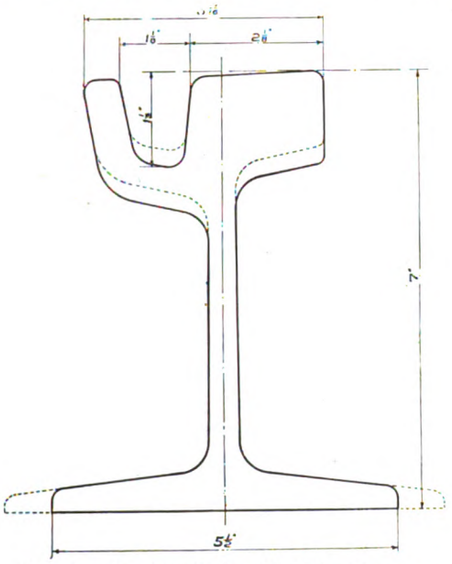

Fig. 1.—Showing Rail with 1½ in. Groove.

in pre-war valuation cases. It was formerly the practice to execute as few repairs as possible to an ageing track, and to concentrate upon early renewals; in fact, it was often economical to remove rails before their effective life was over, where the adjoining road works required attention. To-day the converse obtains; renewals are of rare occurrence, and the life of rails and pavement is being prolonged to the fullest extent by means of rail hardening, groove deepening, the building up of hammered joints by the arc and autogenous welding processes, the reversal of paving setts, and the replacement of sett paving by monolithic surfaces of asphalte and tarred macadam.

RAIL WEAR.

The wear of rails continues to be the most important of all track problems, and all methods whereby the life of existing rails can be prolonged are entitled to the fullest consideration; and in regard to new rails recent experience indicates that it is essential that rails shall be rolled with deeper grooves from steel of a more durable quality than that obtained under the standard specification. In view of the fact that so many undertakings have found it necessary either to deepen the rail grooves or to allow the cars to travel for a considerable period with the wheel flanges bearing on the groove floor, and in a number of instances to adopt a rail with a deeper groove, it is evident that the standard section should be modified so as to provide for a deeper groove. In this country rail grooves about 1½ inches deep have been adopted by the Liverpool, Hull, and Doncaster Tramways. The French standard rails have a groove 1 6-10ths in. deep, and numerous American sections have grooves over 1½ inches deep. There is no disputing the fact that a deep groove is essential, and it is the duty of the Standards Committee to take cognisance of this and other requirements in order that they may direct the necessary changes, for without their supervision the elements and advantages of standardisation will be lost. In connection with the modification of the standard sections to secure a deeper groove the committee should endeavour to obtain the desired result without unduly increasing the weight of the rail. One square inch of additional sectional area represents approximately a 10 per cent. increase in the total weight of the rail, and the writer suggests that this might be counterbalanced by reducing the width of the flanges, and at the same time the rolling mill difficulties would be decreased. There is no reason for any paved-in British tramway rail to have a flange 7 inches wide; this could be reduced to as little as 5 inches with advantage, and the flanges of many of the American and Continental sections and the Leeds and Liverpool sections in this country do not greatly exceed this width. Fig. 1 shows a suggested alteration to B.S.S., No. 4 providing for a groove 1½ inches deep.

The wear of rails is exceedingly variable, and comparisons are not readily made between the wear of rails on different undertakings in consequence of variations in the design and equipment of the rolling stock and the operating and topographical conditions. It is, moreover, difficult to compare the wearing properties of earlier rails with those of more recent manufacture, as the operating speeds, traffic density, and the weight of the cars have been considerably increased, and more powerful motors have been installed, in addition to which the weight and volume of the ordinary street traffic have developed to a very extraordinary extent. The following table gives the rate of wear in thousandths of an inch on certain routes on some of the principal tramway undertakings in the kingdom. It will be seen that there is a considerable difference in these rates

Fig. 2.—Sandberg Rail Wear Gauge.

of wear, and it is not possible to establish a wear curve proportionate to the traffic carried.

RAIL WEAR GAUGINGS.

Tramway.	Wear in Inches.	Cars Carried.	Period. Months.
Glasgow	0·0274	216,000	12
Newcastle	0·028	232,000	12
Leeds	0·0336	131,000	12
Liverpool	0·030	200,000	12
Bristol	0·045	356,000	12
Manchester	0·046	108,000	12
Edinburgh	0·0155	143,000	12
South Shields	0·0160	83,900	12
Sheffield	0·0277	165,000	12
London C.C. (1)	0·130	254,370	12
London C.C. (2)	0·030	539,280	8
London C.C. (3)	0·0416	183,544	8
Leeds (2)	0·0275	86,500	6
Manchester (2)	0·0138	102,675	6
Bury	0·0125	77,750	6
London United	0·0160	65,000	6
London M.E.T.	0·020	63,700	3

The gaugings in question were obtained by means of the Sandberg rail wear gauge, Fig. 2, which has been specially designed to record accurately to within 4-1,000ths of an inch. The wear of the rail profile varies considerably on different systems. On many of the

* Paper prepared for the Annual Congress of the Tramways and Light Railways Association in London on July 15, 1921. A full report of the Congress will appear in a later issue.

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rails where track brakes are used there is a pronounced increase in the inclination of the tread towards the groove, as shown in Fig. 3, which indicates the recently measured profiles of rails which were laid on an important tramway during 1917. In this case, which is not uncommon where track brakes are used, it will be seen that whilst very little wear is taking place on the outside of the rail tread, a very considerable loss of metal has taken place on the gauge side, and if this rate of wear continues the wheel flanges will soon touch the floor of the groove.

At last year's conference of the Association Mr. Ireland, in the discussion on Mr. Pringle's paper, enunciated very clearly one of the most important factors in regard to tire and rail wear. He stated that the worn profile of the rail was brought about chiefly by the shape of the tire, and that "the area of contact had a definite bearing on the subject." Mr. Ireland mentioned that he had discovered by actual experience that "the load per square inch of contact was about 65 tons, from which it was obvious that the tire was being overloaded to such an extent that it would not keep its shape for any length of time, and that loss of metal through detrusion took place, and that it followed that whatever the shape of the rail to begin with, it was ultimately rolled to the shape of the tire." The present writer agrees with Mr. Ireland in regard to the overstressing of the metal in both the tire and the rail tread, and it is obvious in many cases that the elastic limit of the steel is exceeded. At the same time, in such cases as the one referred to above, it is clear that the wear due to the use of track brakes as service brakes, which is dealt with hereafter, is very considerable. The question of increasing the wheel contact, and at the same time reducing the stress in the rail tread, is a somewhat comprehensive one, worthy of independent investigation, and is outside the scope of this paper. In view, however, of the increase in weights and speeds of tramway cars, it is up to the track engineer to safeguard his rails against the effects of the excessive compressive stresses which are admittedly responsible for abnormal tire and rail wear which result in detrusion, battering, and, in the opinion of many authorities, in rail corrugation.

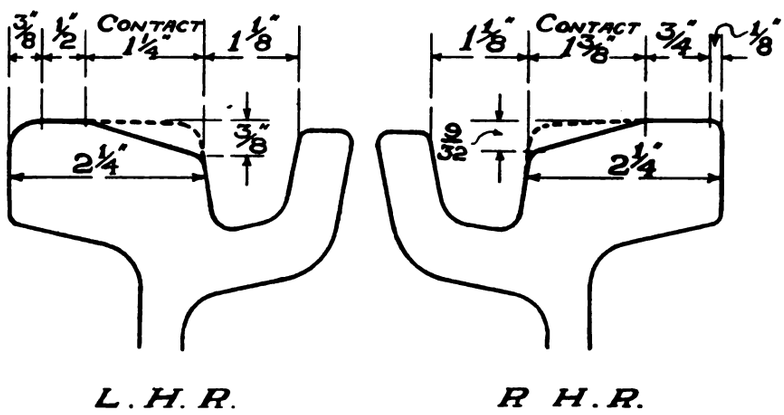

Fig. 3.—Showing Inclined Wear on Rails Laid in 1917.

The precise cause or causes of rail corrugation have not yet been determined, but the Rail Corrugation Committee, on which members of this Association served, definitely established the fact that corrugations do not exist in the rails as received from the mills. Whatever the origin of the force, its culminating effect is to exert such pressure, through the wheel, on to the rail tread that the elastic limit of the steel is exceeded. The late Mr. Stephen Sellon held the view that corrugations are due to this cause, an opinion also held by Mr. W. Worby Beaumont, and a number of American track experts, including Mr. R. Cram, of the Brooklyn Rapid Transit System, and Mr. G. E. Pellissier. In view of the fact that every effort is now being made to prolong the life of existing rails, it is evident that consideration should be given to the manufacture of rails possessing superior wearing properties. For many years the writer has endeavoured to bring the fact home

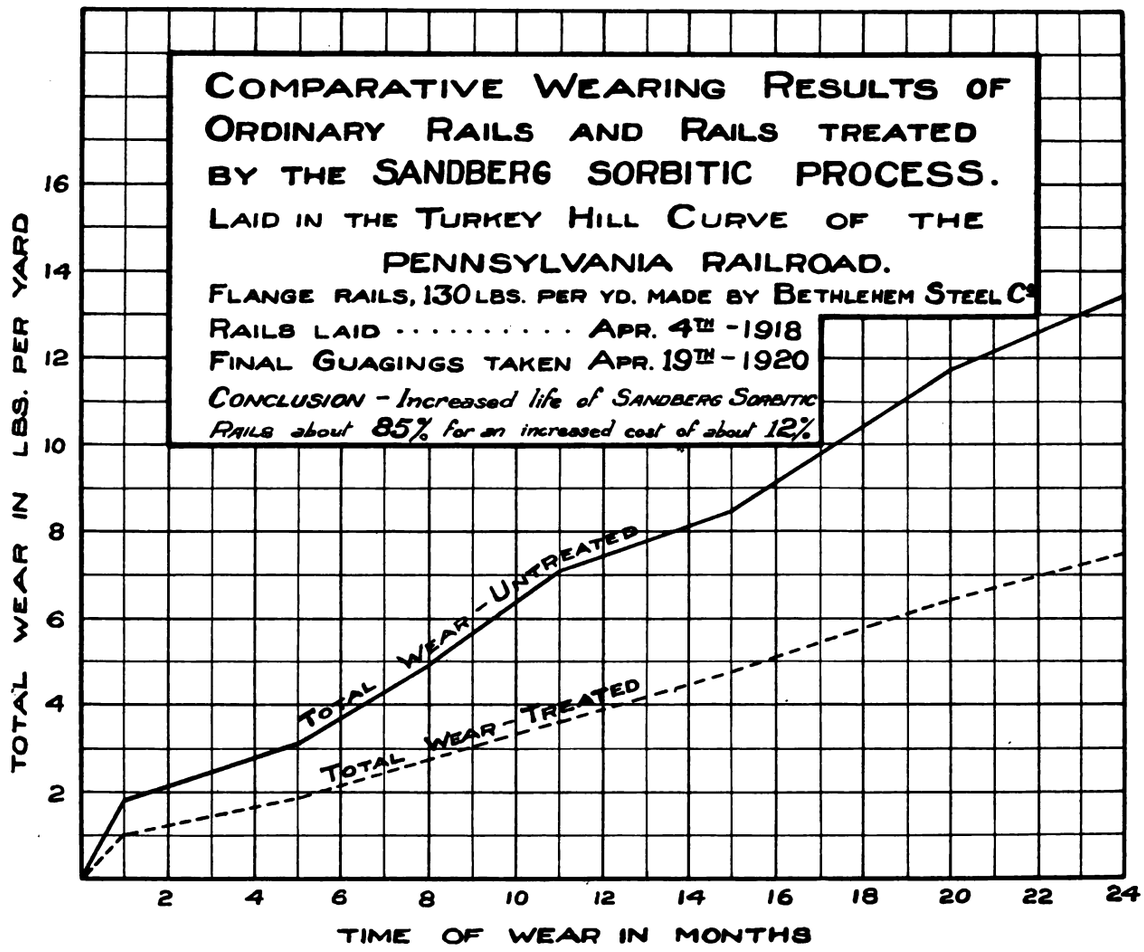

Fig. 4.

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that rails of the standard composition and quality are not suitable for the work they have to perform. The tensile strength of the standard rails is approximately 45 tons per square inch, and the elastic limit is only about 20 tons per square inch, the Brinell hardness number being less than 200. Mr. Stephen Sellon recommended as a preventative of rail corrugation that the elastic limit of the steel should be raised to 60 tons per square inch, and in view of Mr. Ireland's statement at last year's conference it would appear that even this is barely sufficient, with heavy cars of the London County Council type, to resist the pressure exerted through the wheel tire and to prevent the detrusion of wheel and rail metal.

TRAM RAIL SPECIFICATION.

The time is apparently opportune for the Standards Association to consider the revision of the tramrail specification, and in doing so it is recommended that in specifying the chemical composition this should be merely a guide for the manufacturer as to the composition and limits of impurities considered to be likely to produce a material of the required mechanical properties. The specification should not insist on the composition being rigidly adhered to, provided the mechanical and special tests are fulfilled.

Many factors, such as bad conditions of casting, improper heat treatment, burning, etc., may introduce defects infinitely worse

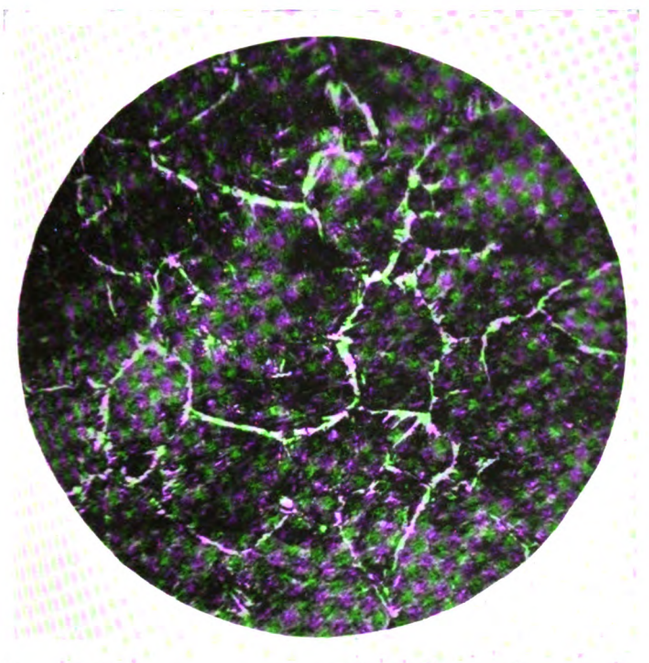

Fig. 5.—Microphotograph showing Sorbitic Structure of Basic Bessemer Rail Treated at the Rolling Mills by the Sandberg Sorbitic Process.

than the mere presence of a few hundredths per cent. of sulphur and phosphorous, and such defects may, without careful supervision, fail to be revealed by either the ordinary mechanical or chemical tests. The tendency is for an inflated value to be placed on the results of chemical analysis, and most specifications overlook one of the most important mechanical properties of steel in relation to its behaviour in service, i.e., the elastic limit, and to attach undue importance to the ultimate strength to which it bears no necessary or fixed relation. The majority of failures of railway material are due primarily to alternating stresses which locally exceed the true elastic limit of the material, and in such cases the ultimate tensile strength, and even the elongation, are of minor importance. Metallurgical science has shown that the most advisable method of obtaining a high elastic limit combined with the necessary toughness is by means of suitable heat treatment.

THE SANDBERG SORBITIC TREATMENT.

The superior physical and wearing properties possessed by rails treated by the Sandberg Sorbitic process, which is applied at the rolling mills, are demonstrated by the very severe operating tests which have been carried out on the Turkey Hill curve of the Pennsylvania Railroad, U.S.A., over a period of two years, and it has been ascertained that the increased life of the sorbitically treated rails was 85 per cent. During the test the actual loss of metal on the treated rails was a little over 7 lb. per yard, whilst on untreated rails the loss was over 13 lb. per yard. The chart, Fig. 4, illustrates the relative wear during the period in question. Figs. 5 and 6 illustrate the difference in micro structure between sorbitically treated rails and untreated portions of the same rail. The effect of the sorbitic treatment is to increase the elastic limit of the steel by approximately 10 tons per square inch. It must be clearly understood that the better and more uniform the original quality of the steel the more satisfactory will be the effect of the sorbitic

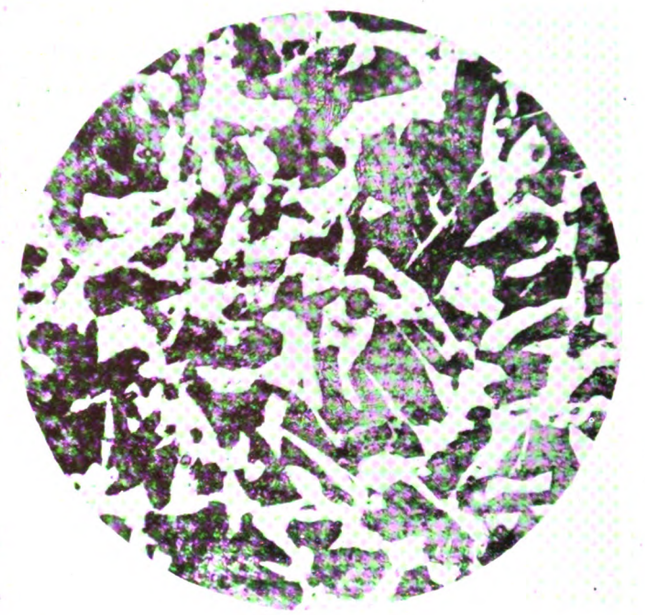

Fig. 6.—Microphotograph of Untreated Portion of Rail shown in Fig. 5.

treatment. It is therefore necessary that every care should be exercised in the drawing up of the rail specification and in the manufacture of the rails.

GROOVE DEEPENING.

The Woods-Gilbert remodelling process is an effective method of prolonging the life of existing rails, and the writer has had numerous opportunities of examining the excellent work executed by this company. By this process the floor of the rail groove is milled away to the extent of about 5-16ths of an inch, thus allowing the wheel flanges to travel free of the groove for a considerable period, and, moreover, this treatment has the effect of clearing away the irregular ridges of extruded metal near the gauge line. In connection with operations of this description it is necessary that

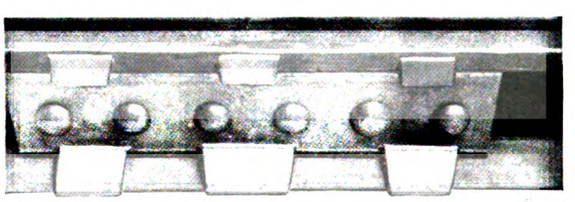

Fig. 7.—Simple Welded Fish Plate Joint.

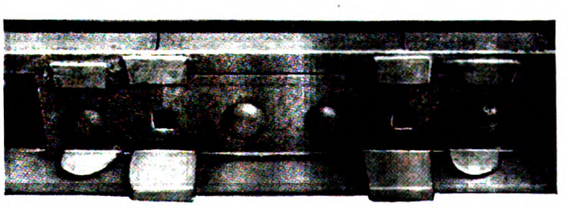

Fig. 8.—"Hammered" Joint Removed, Short Closure Inserted and Welded by Arc Process.

care should be taken to prevent the milling operations from penetrating too far into the floor of the groove, in order to prevent the breaking away of the check. The writer considers that the depth of the metal remaining in the groove after the milling operations should not be less than 5-16ths of an inch; that is to say, in the

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case of B.S. rails it should be possible to mill out approximately one-half of the total metal in the groove floor.

REPAIR WELDING.

The writer has examined a considerable amount of excellent salvage work which has been carried out on numerous undertakings throughout the country in the way of repairs to hammered joints by means of the electric arc and autogenous welding processes. Considerably more use is now being made of the arc welding process than in pre-war days, and certainly from what the writer has seen it is likely to develop in popularity, as it is independent of outside

Fig. 9.—(A) x 450. Normal Pearlitic Structure.

sources in regard to supplies. Satisfactory results can, however, be obtained by either process, provided care is taken in selecting and training operators. These two processes depend entirely upon the skill and conscientiousness of the operator, and certain defects which the writer has seen have been due to either the lack of skill or neglect. Except in the case of the larger undertakings where operators may become efficient in consequence of continual employment on this class of work, the writer considers that it is more advantageous for tramways to contract with experienced firms for guaranteed work of this description. In regard to the deposited metal, it is desirable that this material should be of the same chemi-

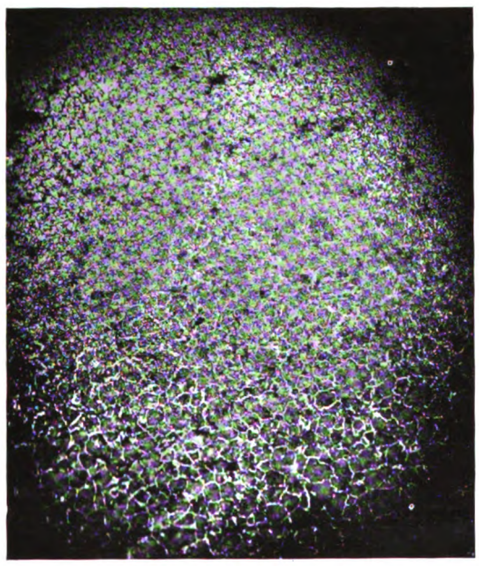

Fig. 9.—(B) x 50. Intermediate Stages showing Gradual Transition.

cal composition and hardness as the rail itself. From the writer's own personal examination on many undertakings it would appear that the metal in many of these repaired joints is much softer than the rail upon which it is deposited, and analyses reveal that the deposited metal is generally lower in carbon. Such metal cannot be expected to withstand the effects of a heavy high-speed car service satisfactorily for any length of time, and although some relief will be felt for a brief period, judging by the cold flow of the deposited metal, it is evident that eventually the "dishing" of the joints may recur. It is not sufficient for a guarantee to be given by the contractors that welding rods of the correct composition will be used in the process; many of the soft joints referred to have been made with high carbon material. It is essential for the contractors to ensure that a sufficient amount of carbon passes through the arc or flame into the deposited metal. The writer understands that this can be arranged to some extent in the case of the arc welding process by regulating the length of the arc. In all cases where metal has been deposited on the rails it is essential that the same shall be afterwards ground to the existing profile of the adjoining rail treads. In repair welding of this description the writer considers that it is well worth the additional expense to have the fishplates spot welded to the rails in the manner shown in Figs. 7 and 8, which is the practice of the Rail Welding Company, London. Where the joints are not too badly battered, excellent results are being obtained by means of a single Thermit weld.

The "receiving" rail end is raised until the valley of the depression is in the same plane as the tread of the adjoining rail; a copper-plated shim is wedged into the joint gap, and the Thermit joint is made in the usual manner. As the rail ends and the shim expand during the operation, a tight butt weld is obtained. The raised end of the receiving rail is afterwards ground down to the same level as the adjoining rail, and an excellent running surface is obtained. In cases where the hammering is too pronounced to permit of satisfactory deposit welding or single Thermit welds being applied, excellent results have been obtained by cutting out the defective portions and by inserting a short closure, the closure being held in position by spot welding, as shown in Fig 8. In each of these cases use is made of the old fishplates, and, if necessary, bolts may be dispensed with when the operation is completed. It is also claimed that bonds are unnecessary, as the conductivity of the

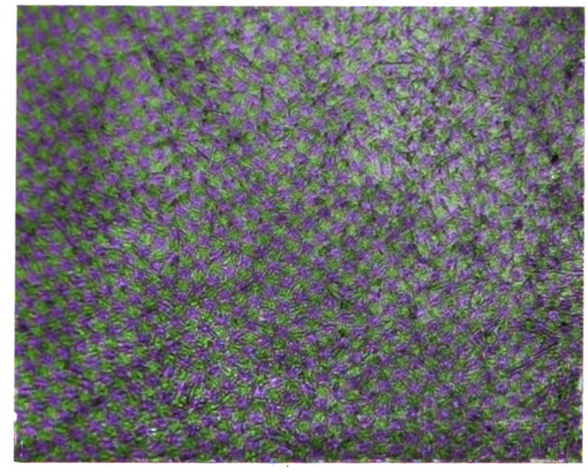

Fig. 9.—(C) x 450. Martensitic Structure at Depth of 1⅛ in.

welded joint is nearly double that of the rail. Very satisfactory and efficient repair welds of this description are now being made by Messrs. Thermit, Limited, and in this case the fishplates are dispensed with, as the closure is held in position by two stout bands of Thermit metal. As in the case of the arc welding process, bonds may be dispensed with. The writer is of the opinion that very excellent repair welding works of the types described above have been carried out, and that the policy in many cases has been a sound one. There are, however, some instances where a definite but short-sighted effort has been made thoroughly to overhaul the track, and put it into efficient working order for a few additional years. Joints with extensive hammered areas have had deep depressions welded or the same have been cut out and replaced with short closures, which have afterwards been welded in. Loose rails have been packed, and a considerable amount of re-paving has taken place. In the writer's opinion, in many of these cases it would undoubtedly have been much more economical and satisfactory had the paving been removed, the defective joints cut out, and the rails butted together with either new welded joints or fishplates. This method is being adopted in several places in conjunction with the groove deepening and rail hardening process.

THE SANDBERG "INSITU" RAIL HARDENING PROCESS.

The "Insitu" rail hardening process, which has been termed a somewhat daring and revolutionary process, was patented by Mr. C. P. Sandberg over four years ago. The apparatus, which has now become quite well known, consists of an oxy-acetylene installation mounted on a truck, which is propelled slowly by hand along the track, whilst the flames from specially designed burners impinge upon the tread of the rail; a small area of the tread is

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raised to a temperature above the critical range, and immediately behind the flames jets of water are sprayed upon the rail, thus quenching and cooling the treated portion.

The treatment produces a hardening effect for a depth of about ¼ in., the outer portion to a depth of fully ⅛ in. consisting of martensite, and therefore of the maximum hardness; below this the structure gradually changes, and becomes softer as the troostitic, the sorbitic, and eventually the normal pearlitic structures are reached. The illustrations in Fig. 9 show the gradual change from the normal pearlite (A) through the intermediate stages (B), to the extremely hard martensite, which forms the outer surface (C).

The "Insitu" process has unquestionably come to stay, and has taken its place on a number of important undertakings as one of the ordinary maintenance operations. Up to date over 100 miles of track have been treated on 23 of the most important tramways in the kingdom, and orders have been obtained for the treatment of a further 30 miles of track. As will be well imagined, the difficulties which have been encountered in developing the process have been very real ones, but they have been overcome as they have arisen, and to-day it is possible, under normal operating conditions, to guarantee that increased durability will be obtained.

The following list shows the comparative rates of wear of untreated rails and rails treated by the "Insitu" process, from which it will be seen that on average the wear of the untreated rails is about 2½ times that on the treated rails—

COMPARATIVE RAIL WEAR GAUGINGS.

Glasgow	Wear on untreated rails	0·027425 in.
	Wear on treated rails	0·013625 in.
	No. of cars carried—216,000.	
Newcastle	Wear on untreated rails	0·0280 in.
	Wear on treated rails	0·01315 in.
	No. of cars carried—232,500.	
Leeds No. 1	Wear on untreated rails	0·0336 in.
	Wear on treated rails	0·0170 in.
	No. of cars carried—131,000.	
Leeds No. 2	Wear on untreated rails	0·0275 in.
	Wear on treated rails	0·0105 in.
	No. of cars carried—86,500.	
Manchester No. 1	Wear on untreated rails	0·046 in.
	Wear on treated rails	0·013 in.
	No. of cars carried—108,368.	
Manchester No. 2	Wear on untreated rails	0·0138 in.
	Wear on treated rails	0·0054 in.
	No. of cars carried—102,675.	
Liverpool No. 1	Wear on untreated rails	0·0170 in.
	Wear on treated rails	0·0060 in.
	No. of cars carried—88,400.	
Liverpool No. 2	Wear on untreated rails	0·030 in.
	Wear on treated rails	0·0125 in.
	No. of cars carried—200,000.	
Bristol	Wear on untreated rails	0·045 in.
	Wear on treated rails	0·0157 in.
	No. of cars carried—356,000.	
Sheffield	Wear on untreated rails	0·0110 in.
	Wear on treated rails	0·0035 in.
	No. of cars carried—60,000.	
London United No. 1 (Acton) ...	Wear on untreated rails	0·015 in.
	Wear on treated rails	0·006 in.
	No. of cars carried—65,000.	
London United No. 2 (Kingston)	Wear on untreated rails	0·016 in.
	Wear on treated rails	0·006 in.
	No. of cars carried—65,000.	
South Shields	Wear on untreated rails	0·016 in.
	Wear on treated rails	0·006 in.
	No. of cars carried—83,904.	
Derby	Wear on untreated rails	0·0067 in.
	Wear on treated rails	0·0025 in.
	No. of cars carried—	
Bury	Wear on untreated rails	0·0125 in.
	Wear on treated rails	0·0055 in.
	No. of cars carried—77,000.	
Edinburgh	Wear on untreated rails	0·0155 in.
	Wear on treated rails	0·0047 in.
	No. of cars carried—143,000.	

There are slight variations, as will be noted, and in two instances not included in the above list the treatment has not been successful in arresting wear, although it has definitely retarded the development of corrugations. The reason for this apparent failure has been scientifically investigated, and has been found to be due to the excessive use of track brakes.

RAIL WEAR DUE TO TRACK BRAKES.

The tramways in question, which might really be classed as one system, as the operating conditions are similar, are the Metropolitan Electric Tramways and the London County Council Tramways. Each of these systems is operated by exceptionally heavy rolling stock, and the exigencies of the service necessitate frequent stops and high speeds between the same, in consequence of which powerful track brakes are necessary to bring the cars to a standstill in a few seconds when travelling at top speeds.

As will readily be conceived, the wear of the rails under conditions which necessitate the pulling up of a 20-ton car when travelling at a speed of close upon twenty miles an hour in a few seconds is abnormally high, and in some positions the rails have a life of from two to four years only. A preliminary examination of the rails at stopping-places and of a number of brake shoes revealed the presence of fine hair cracks on both rails and brake shoes. In the case of the former the cracks run transversely across the rail tread, in the track made by the brake shoes, and are spaced about 1 m.m. apart, as shown in Fig. 10; the cracks on the brake shoes are more pronounced, and run transversely across the shoes at longer intervals, as shown in Fig. 11. Microscopical examination of specimens cut from both rails and brake shoes proved definitely that the surfaces of both had been heated by friction beyond the critical point. An examination of the operating conditions revealed that the operation of the brake consists of a series of "slippings" and "seizings," during which the surfaces of both brakes and rails are evidently raised to a dull red heat, causing them to bind momentarily, and as the surfaces are sliding over one another thin films of the metal, which is softened by the heat, are shorn away from each, the hair cracks referred to being the ocular evidence and result of this action. Under such conditions it is a matter for little surprise that it has not been found possible to retard the rate of wear by the "Insitu" process, and it is questionable whether it is possible to retard this wear by any known means.

RAIL PACKING.

It is interesting to note that the old-fashioned method of packing rails with semi-dry cement and chippings on repair works is dying out, and that the use of tar grouted chippings is becoming more general. The writer is quite aware that good results can be obtained by the former method, but it is not always possible to give the operation the close supervision which is necessary to produce satisfactory results, and frequently, in a misguided effort to ensure

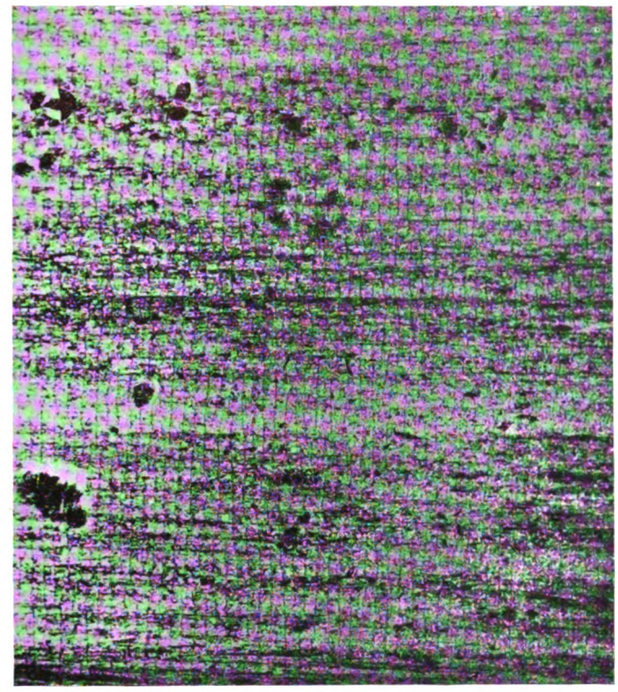

Fig. 10.—Enlarged View of Transverse Hair Cracks on Rail Tread.

that the material is solidly rammed beneath the rails, the packing is consolidated to such an extent that it acts as a wedge and raises the adjoining portions of the rail off its bed. This fault is a common one, and its effects are not felt until the next spell of wet weather, when the rail on either side of the length which has been packed in this manner will show familiar indications of movement.

With tar grouted packing it is not necessary to beat in the aggregate in this manner, and the danger is obviated, and even if the adjoining rail should be slightly raised the tar grout would fill up the space created. In regard to tar grouting and the use of tar compounds generally, the writer observes that obsolete methods of preparing this material still obtain on some undertakings. It depends on the wisdom of some partly skilled labourer or other to mix and heat the pitch and oil in the required proportions. There are no means of weighing, measuring, or testing the ingredients, and protected thermometers are unknown. It is not possible to obtain uniform results in this manner; the compound is generally either under-heated or over-heated, and the composition varies considerably; as a rule it is over-heated (boiled), and many essentials have been volatilised and have passed off as steam. If it is necessary to prepare the composition on the works, proper facilities and trained men should be provided, and in all cases care should be taken not to over-heat the mixture. In order to secure the best

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results it is essential that the composition should be prepared to a definite standard and consistency in a central depot and issued to the works in such a form that it merely requires to be heated to about 150 deg. Fah. It will, moreover, be found to be more satisfactory and economical in the long run to make use of well tried proprietary compounds, such as Bristowe's Tarvia, Plascom, etc., the manufacturers of which have a reputation to maintain.

TRACK PAVEMENT.

Very considerable difficulty has been experienced during the past few years in regard to the maintenance of the track paving; and apart from the prohibitive cost of granite and wood, and the scarcity of these materials, considerable difficulty has been experienced in some localities with the requisite skilled labour, both in regard to scarcity and organisation. In the Metropolis as a rule wood or asphalte pavements are the only qualities permitted by the authorities, and in the provinces, where large areas are paved with granite setts, considerable difficulty is experienced in maintaining the surface on account of the destructive effects of the steel-tired wheels of the modern mechanically-propelled street traffic. It is certain, in many industrial centres, that the compressive strength of the most durable granites has been greatly exceeded. The pavement problem is a very acute one, as with the mixed traffic on the streets and the severe gradients in many towns it is obviously impossible to provide a surface equally suitable for horse-drawn and mechanically-propelled traffic, and one is inclined to anticipate the advent of legislation which will relegate the slower-moving traffic to scheduled side streets. In regard to monolithic pavements for tramways, it has been too readily assumed that the disadvantages of this form of construction outweighed the advantages, but the writer is of the opinion that very satisfactory track pavements can be obtained from the use of both asphalte and tarred macadam, either with or without a course of setts alongside the rail; much will depend upon the care taken in preparing and laying the materials, which will, of course, have to be selected with a view to their suitability for the prevailing traffic. At the present time exceptionally good asphalte pavements, containing a proportion of granite crystals, are being laid on the Leeds tramways, and at Bath excellent and durable tar macadam track pavements have been made by Mr. Hardy for many years.

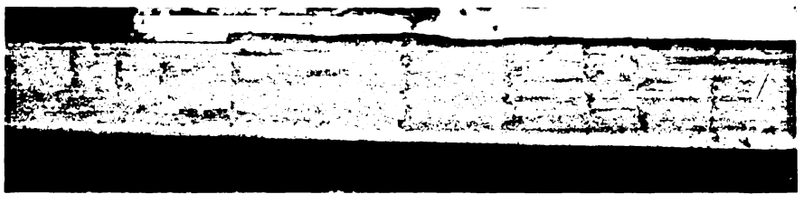

Fig. 11.—Showing Hair Cracks on Track Brake Shoe.

SPECIAL TRACKWORK.

The cost of points and crossings and tramway layouts is a very serious item in these days, and one is not surprised to hear of engineers reverting to the old-time practice of building their own junctions with scarfed crossings, more particularly so as a much better job can be made than formerly, in consequence of the availability of the arc and autogenous welding processes. It is the writer's opinion that considerable economies could be effected by the use of shorter and lighter points and crossings, and it is hoped that the Standards Association will give the matter their consideration. As a rule points and crossings are far too heavy in design, and the fullest advantage is not taken of the extraordinary strength and wearing properties of manganese steel; the proportions of the castings are frequently more suitable for cast-iron than for a super steel of this description. The design of points and point mechanism requires considerable simplification; there are far too many refinements and adjustments in the modern points and too many cumbersome attachments in the shape of auxiliary boxes of appreciable size, and it is not clear to the writer that these more modern points give any better results in service than the more simple forms that preceded them.

TRAMWAY LEGISLATION

In conclusion, the writer would like to refer to a recent County Court decision that a tramways undertaking is responsible for accidents arising out of the worn condition of the rails; also to the coroner's statement in a recent case to the effect that the accident was due to the neglect of the County Council in not having rendered safe a temporarily worn-out rail. It would appear that such decisions may have a far-reaching and detrimental effect on the operation of the tramways throughout the country, for who is to decide when a tramrail is worn out, or even when it is worn? It is obvious that tramway undertakings require far more protection and assistance than they obtain from the archaic Tramways Act, and that in regard to road maintenance they should have the same safeguards that the Highways Authority enjoys under the common law.

It is well established from the many decisions of the courts that a Highway Authority is not liable for accidents due to non-repair of a highway (non-feasance). The authority is only liable for injury sustained by an accident due to some particular defect arising out of works executed or alteration to existing works which may be attributed to negligence of their servants (mis-feasance).

GERMAN BID FOR MOTOR TRADE.

Trade with Russia, South America, and Switzerland.

From an article contributed to various newspapers by Mr. George Renwick, writing from Magdeburg, it appears that the German motor traders are making strenuous efforts to push their private and commercial vehicles in foreign countries. There are eighty large motor factories and numerous smaller ones, employing between 30,000 and 40,000 workers, as well as a considerable number of firms which devote only part of their energies to the production of motor cars.

The makers with whom Mr. Renwick has spoken believe in an early and great development of motor traffic in Germany for passengers and goods. An indication of the existence of this belief is provided by the fact that great garages are being built at various points. Berlin has a large special one (in addition, of course, to all the ordinary small ones which exist in all towns and cities) to cope with heavy "through traffic," and Hanover has just spoken the last word in this matter.

Russia and the frontier States are regarded as lands of hope. Before the war Russia took one-quarter of Germany's motor exports. Motor vehicle producers are nursing South American trade for all they are worth. Brazil, for instance, last year imported 24,475 cars and wagons. The following countries contributed to that number—United States, 15,109; France, 3,018; Germany, 2,277; Italy, 1,282; Great Britain, 586; Switzerland, 506.

In South America the motor car will most certainly be used to provide a great "Ersatz" for railways. Probably only Russia will provide a bigger field in this connection. Venezuela, for example, a large exporter said, has just completed the construction of 1,800 miles of motor roads. Chile is following this example.

Switzerland is another very profitable market for the German automobile industry. The demand for cars there is greater than ever, and German agents are very busy and successful. In the first nine months of 1920 Swiss automobile imports were valued at 56,250,000 francs. To that amount there contributed—Germany, 17,717,824 francs; United States, 16,571,516; France, 11,232,610 francs; Italy, 6,451,056 francs; Great Britain, 301,624 francs.

There is a marked desire for British cars, which have a better reputation than any other, and the prices ruling in the country are such that competition ought to be fairly easy. There is no bar in the shape of a high import duty. British firms, too, have not to contend with such transport difficulties as have the Americans. A little enterprise by our makers would undoubtedly result in good trade in light and heavy cars and motor cycles.

The total export of German vehicles in the first eight months of 1920 was 14,024 cars of various kinds (value M.883,000,000). About 20 per cent. were former army cars, wagons, and cycles. During that period one-fifth of Germany's motoring trade exports went to Entente countries, and four-fifths to "neutral" lands, a considerable amount of the latter proportion finding its way, however, to the former destination. Latest statistics (the first for seven years) show that Germany exported 6,419 cars, etc., in 1913, so that the increased production shown by the 1920 figures, making allowance for the export of army cars and the flow of production abroad which formerly would have remained on this side of the frontier, must be fairly considerable. Exports to various countries are given in weight, and those to England are—1913, 5,399 double centners; 1920 (eight months), 32,772 double centners.

Aberdeen Corporation Tramways.—The financial year closed on May 31, and the annual report gives the following figures—Total passengers carried, 41,394,652; total traffic receipts, £190,727; decrease in passengers compared with last year, 4,593,832; increase in revenue, £21,798. The total revenue for the year was £191,473, being an increase of £21,742. It had been estimated that the revenue would amount to £194,700. In order to balance the shortage, expenditure was cut down to a minimum.

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ELECTRIC ARC WELDING.*

By Henry M. Sayers, M.I.E.E.

Tramway engineers have made as extensive use of arc welding for repairs and maintenance work as anybody. In some applications they were among the pioneers. I therefore do not propose to take up time in recounting work done within my knowledge on tramways. It is probable that my audience collectively knows more than I do of what has been done. I hope that in the discussion members will give instances of work they have themselves done which is novel or otherwise of special interest. I shall be grateful for such contributions, which should, to be of the fullest value, include failures as well as successes, because much may be learned from failures. No one can say that the art of electric arc welding has arrived at the stage of perfection. It is only by trying that its limitations can be defined, and from the results of trials which are not wholly successful lessons may be learnt which will either widen the usefulness of the method, or show definitely what it cannot be expected to do—both useful results.

I will at once illustrate this by some instances of non-success.

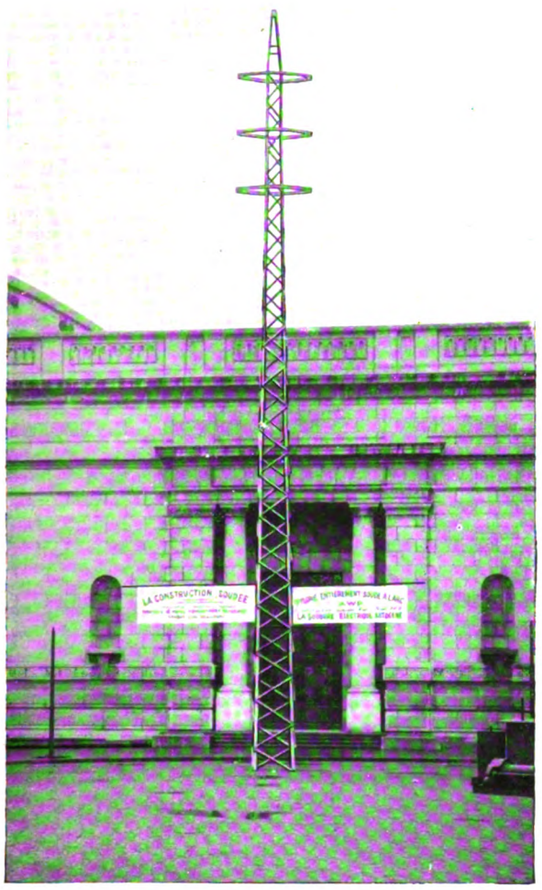

Fig. 1.—Lattice Mast.

A corrugated boiler flue developed cracks along the crest of a corrugation a short distance from the flanged end of the flue which is fixed to the boiler end plate. This was clearly a failure due to the "breathing" action of expansion and contraction under variations of temperature and pressure, setting up binding movements which concentrated on the end corrugations. The crack was chipped out and arc welded, and after a very short time again failed. Now it was clear on the face of it that the binding action concentrated on the place in question to such a degree that the original plate failed. Unless therefore the weld metal were more resistant to bending stresses than the original plate it could not be expected to make a permanent repair. Also that the plate immediately adjoining the crack must have been near its failing point, which the welding could not remedy. No one who knows anything about arc welding can say that the deposited metal is as resistant to bending stresses as good boiler plate. Even if it were more resistant it is well known that a change of properties of this kind brings about a concentration of stress, just as a change of sectional area does. Clearly a rational method of repairing this particular part would have included the application of some reinforcement which would have taken up and distributed the concentrated stress. It was not arc welding that failed, but an ill-considered application of it. Generally I would say that where it is sought to repair a part which has failed from repeated bending stresses, or other reversed stresses, the repair should be carried out by reinforcing the part, which can very often be better done by welding on a reinforcement than by other means. This is not an admission that arc welding is useless for such repairs, but a warning that it should not be expected to accomplish impossibilities. No one would expect to make a permanent repair in, say, a brass piece which had failed in such conditions, by making a butt braze across the fracture.

In another case a cast-iron column which in its normal work carried large and rapidly reversed compound stresses cracked right through near the base. This was successfully welded, but on being put to work a crack started again near the welding line, at one angle where the stresses are naturally concentrated. This was stopped by attaching heavy reinforcing plates at the angles, extending across the weld. Here again it was evident that the failed part had been unable to resist stresses which came upon it, and reinforcement was indicated. These things should be taken into account. If a part has failed owing to some unusual accident, it is quite sufficient and reasonable to make a welded repair which restores the normal section. If a part has failed under its normal working conditions, it should be sought to make the welded repair of such a character as to reinforce the part against the working stresses. Particularly is it undesirable to put a weld in such a position that considerable bending stresses come upon the weld itself. The weld metal may, and if the work is properly done will, unite thoroughly with the original metal. It may also match the chemical composition of the original metal, but it may very probably be of somewhat different mechanical properties, and such a difference, even if to the advantage of the weld metal, will produce some concentration of stress in the neighbourhood, exactly as a sudden change of section in a stressed member concentrates the stress.

These remarks must not be taken to mean more than that arc welding repairs must receive the same consideration on general mechanical principles as any other repair methods. I would, in fact, suggest that it is easier to give due application to these principles by the use of welding than by any other method in a great many cases. For example, if one repairs a broken part by bolting or rivetting on cover plates, or flitches, the original parts are weakened to at least the extent of the drilling for the bolts or rivets. But probably I need not enlarge on this point, and the discussion may bring out other cases of non-success of which the causes are less obvious.

There are some relatively recent applications of arc welding for constructional purposes, as distinguished from repairs, which may not have come under the notice of some members, and may be directly useful for them to know about, as they may suggest similar applications in their own work.

One example is the building up of lattice work masts or poles by arc welding. Lattice poles are not much used in this country for tramway work, though, of course, they are familiar enough as signal posts on railways, and the overhead work on the Brighton Company's electrified lines is almost entirely supported by such poles. They have some advantage over tubular poles. Fig. 1 shows such a welded mast under test. It is one of 500 ordered by an electric supply company for transmission lines. The total length is about 67 feet (21·75 metres). The calculated load from the wires in a maximum gale is a lateral pull of about 300 pounds. The test shown in progress in Fig. 1 is a dead weight of twice this amount. The deflection was very well within the specified amount, and there was no permanent set. If this had been a rivetted mast it would have shown some permanent set, as the accumulation of the little slacknesses of many rivetted joints usually results in some permanent set under a test load, or even under the working load. So that a welded-up mast of this kind has a greater initial stiffness than a rivetted mast. There was a saving of weight over a rivetted structure of about 10 per cent. The speed of manufacture is higher than for rivetting. Two welders can finish a mast in nine hours' work. The cutting to length of the steel is, of course, much the same in both cases, but there are no rivet holes to drill. The total cost of manufacture is reckoned as about 40 per cent. less than that of a rivetted mast, or, say, one can buy three welded masts for the cost of two rivetted masts.

The structure is square in section, with T iron at each angle, and the diagonals or lattice bars are also of T iron.

Another direction in which a good start has been made is steel structural work. During the last two years several steel buildings

* Paper prepared for the Annual Congress of the Tramways and Light Railways Association, in London, on July 15, 1921.

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have been erected in this country, and others abroad, in which welding takes the place of rivetting. The process is particularly advantageous for steel roof trusses, stanchions, overhead crane bearers, and similar things. In large jobs the process offers very considerable advantages. All the members can be cut to length at the steel works, transported to the building site in bundles, requiring no mechanical work of any kind on the site. The process of assembling, say, a roof truss is quite simple. The members are laid in a jig, or on a marked-out floor in their correct positions, and then welded up in place. There is no marking-off and drilling for rivet holes, no tentative assembling and drifting or other correction of holes which may not quite line up. It may be necessary to turn the truss over, after welding on one side, to make the welds on the other. These operations are all the handling necessary

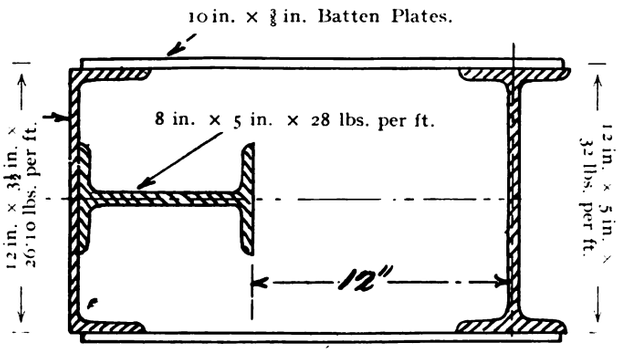


Fig. 2.—Section of Stanchion.

beyond, of course, the actual placing in position. There are no rivet heating fires to smoke out the place and incommode other workers.

The actual welding is a considerably quicker operation than rivetting. This is very particularly the case as regards the final fixing of the trusses and other parts in position. It is much easier and quicker to weld than to rivet on roof frames up aloft.

The welding method has some other advantages, of which probably the full extent has been hardly realised. In designing a rivetted structure the draughtsman must always have in mind the rivetters' work, and must not merely see that this is practicable—quite an easy thing to overlook in some cases—but also that the rivetter should not have to do his work in awkward places and awkward positions. The facility of rivetting dominates the design. Also the weakening of members by the drilling has to be allowed for, and palms and gussets introduced to obtain a sufficient number of rivets and a sufficient spread of the joint surfaces to secure a safe and stiff job. These requirements add to the weight of the structure, sometimes to quite a large percentage, and more to the cost of the material.

A designer who plans for welding the joints has a free hand. He can build up a member in ways to which rivetting would be either inapplicable or unduly costly. He may be able to dispense entirely with such additions as gusset plates, palms, etc., or at least cut them down very materially. He must provide sufficient butting or lapping surfaces at the joints to give an ample section and surface of weld, and he must study the welder's convenience. In practice it has already been found that this freedom leads to considerable economy of material. It is possible to design members which could not possibly be rivetted, but can be welded very readily. For example, Fig. 2 shows a stanchion of rectangular section made up of two I joists, one channel, and distance plates at intervals. This could hardly be rivetted, as anyone can see who looks at the section and tries to plan out the sequence of rivetting operations. It is quite easily put together by welding, and then becomes a member in which every part contributes its full share to the strength and stiffness.

Similarly the girder carrying an overhead crane rail shown in Fig. 3 is a simple, cheap, and effective design not possible for rivetting.

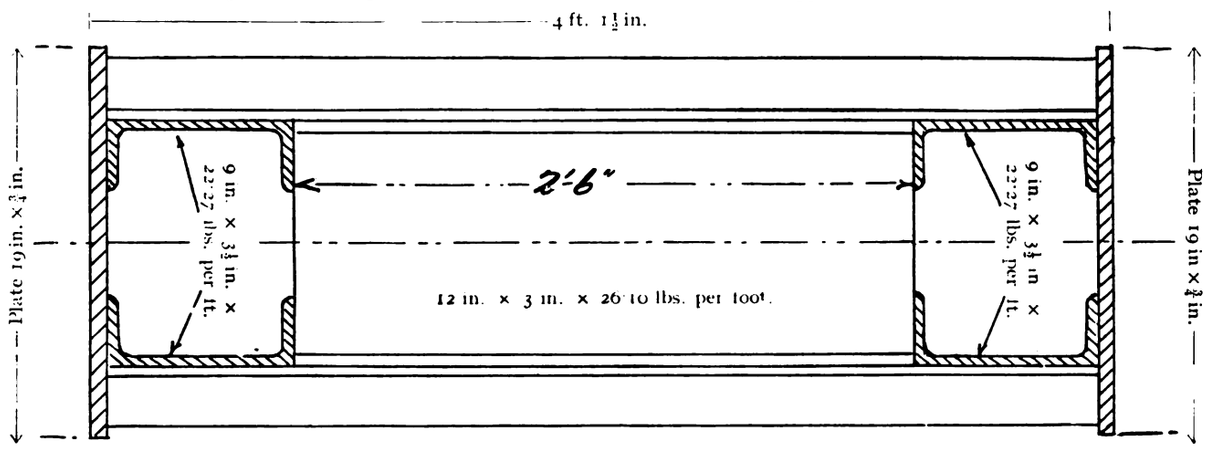
In both these cases there is no added weight of material and no reduced strength, necessitated by rivetting requirements. Ample welding surface is obtained with no additions to the stock sections.

It will perhaps be realised that this facility of design conduces to economy in the cost of material, because standard sections can be utilised throughout with no parts cut to special shapes and dimensions, which special parts cost much more than their weight value, and frequently cause cumulative delays. Figs. 4, 5 and 6 show in plan and elevation the work of which these two members form a part. It may be noticed that on each side of the main principals there are lateral extensions or lean-to rafters. These were welded up to the main trusses after both were in position, the design being so arranged that the parts sandwiched and overlapped to give a substantial welding surface. The welding up in position was quite an easy matter.

The only special appliances which have to be taken to the site for assembly and erection are one or more welding sets, according to the extent of the work. If there is no electric supply available these have to include a prime mover, usually a petrol or paraffin engine. If an electric supply is available the welding set is either a motor generator or a transformer. The supply may be either continuous or alternating; good welding can be done with either.

There is a considerable saving of labour cost by welding as against rivetting in this kind of work. One cannot state it as a general percentage. The only way to get that is to ask for tenders for a particular job, but obviously to make a real comparison the detail designs should each be such as suit the jointing method. One might weld up a job designed for rivetting and find a saving, but certainly not nearly so much as if the work were designed for welding. Whence it follows that a designer who understands the possibilities of welding is required for the purpose of getting a real comparison. A welded job of this kind can be carried out in much less time than a rivetted job. Generally nothing but stock steel sections are required. The steel works will cut these to exact lengths, and the assembling and erection can be started at once; no waiting or drilling or other machining, because the small inaccuracies of shearing, etc., can be readily made good by the welder.

The absence of permanent set due to the slipping of rivetted joints in such structures may sometimes be of importance. That it is a fact was shown by a recent case in New York. The city building authorities would not give their definite approval to the plans for a welded-up roof. It was too novel, or they were too cautious. They passed the plans provisionally, the proviso being that they must be satisfied with a double load test after completion of the framework. This test was applied by sandbag loading equal to double the roof sheeting plus the maximum snowfall weight reckoned on by the building department. The roof stood the test entirely to the satisfaction of the inspectors, who put on record that on taking off the load there was no measurable permanent set, which does not happen with rivetted work.



12 Diagonals 3 in. × 3 in. × ½ in. L; 8 Diagonals 4 in. × 3 in. × ½ in. L; 12 Diagonals 5 in. × 3 in. × ½ in. L.

Fig. 3.—Section of Girder.

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Steel reinforcement bars in reinforced concrete work can be welded where they meet to give full strength and stiffness equal to continuous bars.

It is probably already known to some members that long lengths of steam pipe have been made up with welded joints and give complete satisfaction. A rather newer development is the welding up of large steel pipes for hydraulic power work. I cannot say whether this has been actually carried out, but I understand that tests have satisfied those who are carrying out a large work of this kind, and preparations are in hand for the welding of well over 100 miles of very large pipe. This will be welded on the longitudinal seams, and circumferentially at the joints.

Another application known to some members is the welding up of steel wheels for heavy motor vehicles, including omnibuses. A considerable number of these have been for some months in heavy service, I understand, with quite good results. There have been some failures, but considering the heavy nature of the work and the great uncertainty of the stresses which arise, it would be surprising if the first design were incapable of improvement. I do not know that any troubles met with were due to insufficient factor of safety in the design. There may have been collisions with lamp-posts or something of that nature.

I would like to suggest, as an application of these experiences with steel structures and so forth, that it may be possible to lighten and cheapen the construction of car bogies and frames by a skilful application of welding in place of rivetting and bolting. This seems worth the consideration of tramway engineers and car builders. I know, and some members of this association know, that a good many broken truck side frames have been arc welded, and have stood up well in service, so that it seems that the effects of the shocks and vibrations to which cars are subject are quite well withstood by arc welding properly done.

Fig. 4.

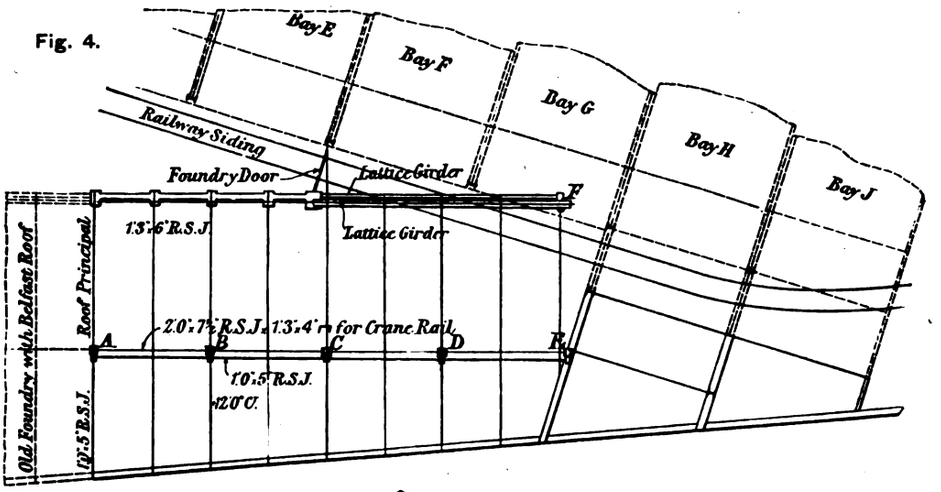


Fig. 5.

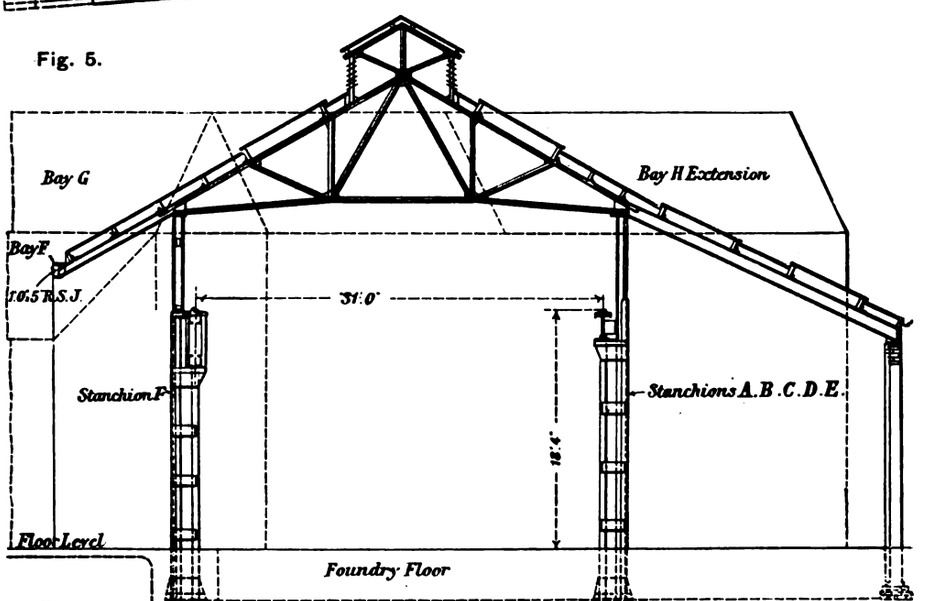
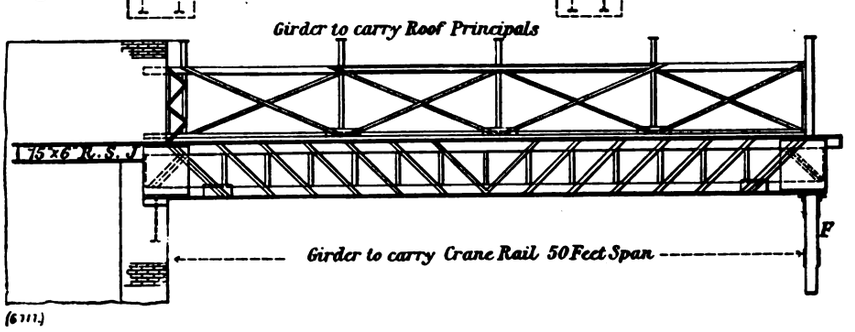


Fig. 6.



(611.)

Welded Roof Plan. Welded Roof Elevation. Runway Girder (side view).

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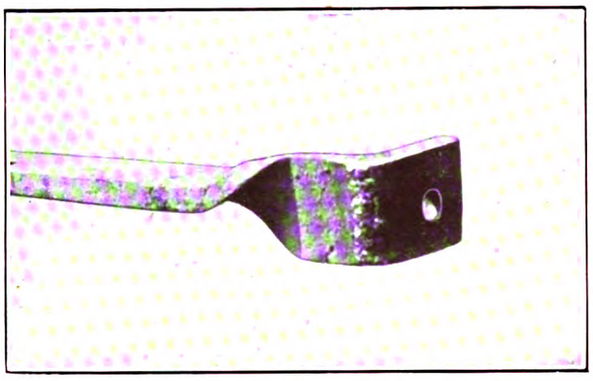
Now I want to turn to some rather specially technical points—that is, of welding technique. They really are of interest to traction engineers, because they indicate wider applications of the art, and they are also of scientific interest.

In this country the use of covered electrodes for arc welding has been developed much more fully than elsewhere. The Americans have done, and continue to do, a great deal of arc welding, but for some reason or other they are extremely sceptical about the advantages of covered electrodes. Certainly bare electrodes are cheaper, and perhaps as long as one confines arc welding to work on mild steel, where a weld metal of nearly pure iron meets the requirements, quite good work can be done with the bare electrodes. But I am sure from what I have seen of work done with both that properly



Suspension Bar Repaired.

covered electrodes give better welds. I say this from the microscopical examination of a good many welds. I do not profess to be able to place a series of welds in the exact order of merit in which they would be placed by mechanical tests by microscopic examination alone. There is one very good reason for this. A section of a weld is a sample which may be better or worse than the bulk of the weld, and naturally mechanical tests show up the worst place in a weld if there is a worst place. It is a matter of chance whether the section for the microscope does this. But I have found generally that the microscope grades welds very closely in the same order as the mechanical tests, and I therefore say that my examinations show that generally welds made with covered electrode in mild steel are better than those made with bare electrodes. I think this is especially the case where alternating current is employed.

The covering fulfils two objects which are almost obvious. In the first place it protects the electrode from oxidation whilst heated above the arc, and whilst molten at the arc itself. The molten covering dropped on to the work around the arc also protects that from oxidation. If the covering is of proper composition, it acts as a flux, which not only protects the hot surfaces from oxidation, but unites with any oxides—and there is always some oxidation—into a fusible slag. This slag should be so much more fusible than the metal that it will rise rapidly to the surface, and not remain entangled with the molten metal, forming a slag inclusion and a point of weakness in the weld.

But there is yet another purpose which can be served by the covering when it becomes a flux or slag in its molten condition. By properly relating the chemical composition of the covering, i.e., eventually the slag, to that of the electrode and the metal to be welded, chemical action will take place between the slag and the molten metal which will give the latter a final composition pretty closely approximating to that of the stock metal, so making a homogeneous joint. I am aware that doubt has been cast on this claim, but I have been convinced of its soundness by the results. For example, arc welding on cast-iron has been generally considered as somewhat unsatisfactory because the weld metal is much more nearly a pure iron in composition and structure than a cast-iron. For some purposes this may be all right; for some purposes it may not. It is, however, quite possible by using an electrode and a covering of proper and related composition to put down a weld metal which under the microscope is indistinguishable in structure from typical cast-irons. It shows evidence of as much carbon contents, though I cannot say that this has been verified by analysis. A curious thing is that the electrode is not a cast-iron one. The

Weld Bent to Small Radius.

resulting weld metal is a synthetic cast-iron produced by the reaction between the slag from the covering and the metal of the electrode. Similar results have been obtained on a number of special steels. I do not know that it can be said at present that a satisfactory electrode can be supplied for every one of the many alloy steels now in use for special purposes, but I know that it has been done for several, and it seems probable by analogy that it can be done for any case where a sufficient demand arises. It may, of course, prove that some of these alloy steels cannot be matched by any electrode and covering combination. Manganese steel, of particular interest to permanent way engineers, can be satisfactorily welded by a proper combination.

It is quite consistent with well-known facts in steel metallurgy that this should be the case. In all modern steel making processes the slags play a most important part in controlling the composition of the metal. They combine with some of the impurities; they may add some constituents. In some cases two or more slags of different compositions are put into the furnace in succession for different purposes. Hence it is quite logical that in arc welding the slags formed from the electrode covering and the metal oxides, together, perhaps, with some of the constituents of the electrode, should react with the metal, giving it a desired definite character. I am not in the secrets of electrode making, and it can be understood that some of these are valuable trade secrets, the result of expensive experiments, but I can say that the results are obtained.

As regards the removal of what would otherwise be non-metallic inclusions of oxides and other compounds, the action is relatively simple. The oxides formed when iron is heated to and beyond welding heat are a little more fusible than wrought-iron, and less

Welded Steel Wheel.

Welded Steel Wheel.

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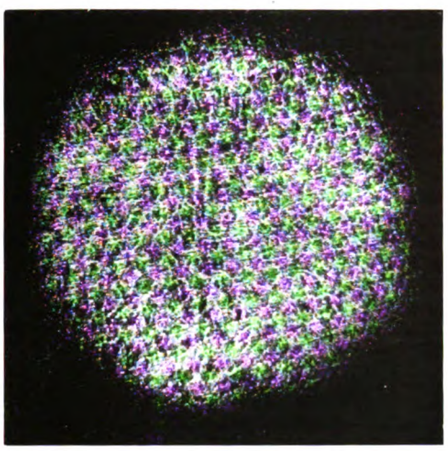
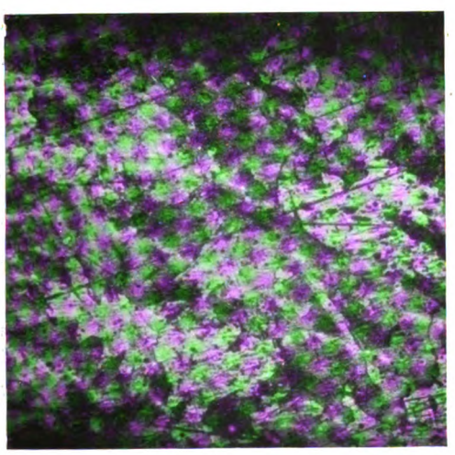
fusible than cast-iron. That is why a smith can weld wrought-iron. The oxide scale formed on it is molten whilst the iron is still unfused, and the hammer blows drive out the liquid oxide from between the iron surfaces. But the smith cannot weld cast-iron, because the cast-iron melts before the oxide. Short of the melting point of the cast-iron the scale is still solid and cannot be squeezed out. Steels come between cast-iron and wrought-iron in melting point, hence some can be smith welded and some cannot. But even at wrought-iron welding heat the iron oxide is a rather viscous fluid. Silica will unite with the viscous oxide to form a much more fluid slag of iron silicate, which separates readily from the molten metal by gravity. That is why the smith sprinkles sand on the surfaces he proposes to weld together. The silicate is more fluid than the oxide, and therefore more thoroughly driven out by the hammer



Weld Metal from Bent Weld, 42 Diameters.

blows. Hence all electrode coverings which really flux contain either silica or some other body which combines with iron oxide to produce a more fluid slag. The weld metal is at a much higher temperature than the smith's welding heat, so that although there is very little time for the separation to occur, both metal and slag are fluid, and the slag rises through the metal if it is entangled in it very quickly.

One other result from using covered fluxing electrodes may be mentioned. Molten iron in contact with air, besides being oxidised by the oxygen, absorbs nitrogen which remains in the metal as a nitride of iron in the form of thin plates. It is believed that these nitride plates make the metal brittle. American writers on arc



Weld Metal from Bent Weld x 1,000 Diameters.

welding make a good deal of this nitride formation, and state that the compound is always present in arc welds. As above stated, American arc welding is almost entirely done with bare electrodes, so that there is nothing to keep the air away from the hot metal. Electrodes with fluxing coverings protect the hot metal from air contact to quite a large degree. Hence there is not only less oxidation but also less nitrogen absorption, and I can say from personal knowledge that welds made with such electrodes show very much less evidence of iron nitride than those made with bare electrodes. In fact one may often examine a considerable number of welds and find no nitride lines. This is a very considerable gain, because there is strong evidence that nitrogen is a bad constituent of steel in respect to mechanical qualities. I ought to say that the metallurgical chemists are not entirely agreed about iron nitride, and I understand that there are analytical difficulties in determining the condition in which the nitrogen occurs, and even in determining its quantity, but I think they are agreed that nitrogen is a good thing to keep out of steels.

I hope that this paper will bring to the notice of some members facts indicating that electric arc welding is still developing its sphere of utility in directions which may be of use to them, and I shall be very well rewarded if in the discussion members digress a good deal from the subjects dealt with by relating their own experiences, successes, difficulties, and failures, from which we may all learn much. Difficulties and failures ought to be signposts on the road of progress; if some of them are danger signals it is even more desirable to know of them.

FINANCIAL REPORTS AND MEETINGS.

Loss on Belfast's Tramways.—There was a debit balance of £21,361 on the working of Belfast City Tramways for the year ended March 31 last.

Accrington Corporation Tramways and Electricity Committee report a loss on the year's working of £10,029, which is equivalent to a 1s. 5d. rate.

Great Yarmouth Corporation Tramways experienced a loss last year of £3,229 on the tramways and £236 on the omnibuses, after paying interest and sinking fund.

Yorkshire (West Riding) Electric Tramways Company have decided to pay an interim dividend of 3 per cent., being at the rate of 6 per cent. per annum, on the 6 per cent. cumulative preference shares for the half-year ending June 30, less income tax.

Loss on Burton-on-Trent Tramways.—There was a loss of £6,459 on the year's working of Burton-on-Trent Corporation Tramways, although the revenue had increased by £5,441. Passengers carried numbered 4,293,649, against 4,400,328 last year.

Edgar Allen and Company.—For the year ended March 31, 1921, the net profits amounted to £42,109. A final dividend of 1s. per share free of tax is recommended, making 2s. per share for the year. A sum of £30,246 is carried forward, which compares with £43,568 brought in.

Bradford Corporation Tramways.—It was reported at a meeting of the tramways committee that there was a net loss of £22,245 for the financial year ended March 31. Although the total receipts of £718,538 were a record—being an increase of £109,547 over the previous year—working expenses were higher by £152,369.

United Electric Tramways of Montevideo.—For the year ended March 31 there is a credit balance of £81,939, including £7,032 brought in and after charging £46,539 for debenture interest. The sum of £30,000 is placed to renewals and contingencies, and a dividend at the rate of 4 per cent., less tax, is declared, leaving £8,477 to be carried forward.

Ayr Corporation Tramways.—At a meeting of the Town Council it was reported that the tramway revenue account for the year ended May 15 showed a deficit of £5,459. The tramways committee recommended that 4 per cent. instead of 6 per cent. be carried to depreciation account and that the remaining deficiency be made good from the reserve fund. The reserve fund would then be exhausted, and unless the finances improved the tramways would become a heavy charge on the rates.

Walsall Corporation Tramways.—In moving the adoption of the tramway and omnibus accounts, at a meeting of the Town Council, Alderman J. Cope said for 17 years there had been a credit balance. The net profit for last year on the tramways was £3,107, and it was regarded as a satisfactory result. Charges for wages and material had been at the top figure during the year. Fares were not increased until the end of November. With regard to the omnibuses, they had made a profit four years out of six years. The net loss last year was £9,940, and it was due to the price of petrol.

Norwich Electric Tramways.—The receipts for the year ended June 30, 1920, amounted to £72,464, an increase of £14,617, as compared with the previous year. The total expenditure, including debenture interest, was £61,600, an increase of £17,632. The net profit amounted to £10,863, a decrease of £3,014. Including £167 brought forward from last year, the sum available is £11,030. The directors have allocated £714 to writing down the cost of the turbo-generator and have transferred the balance of £10,316 to the reserve account. The total number of miles run was 947,448, an increase of 192,101; the number of passengers carried, 14,671,084, an increase of 2,194,365; earnings per car mile were 18·36d., a decrease of ·02d.; expenses per car mile, 14·94d., increase of 1·88d.

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MERTHYR ELECTRIC TRACTION AND LIGHTING COMPANY.—The report for the year 1920 shows that the receipts amounted to £32,100, as compared with £39,200 in the preceding year. There was an increase in expenses of £11,860, leaving a net balance of £11,000. After deducting interest and providing £5,000 for renewals, and including £600 from the last account, there is a disposal balance of £5,900. Preference dividend requires £1,500, and the directors recommend a dividend of 6 per cent. on the ordinary shares.

NEW GENERAL TRACTION COMPANY, LIMITED.—The accounts of this company, which owns the Norwich Electric Tramways, Limited, and the Douglas Southern Electric Tramways, Limited, for the year ended March 31, 1921, shows that the revenue amounted to £19,485 and the expenditure, including debenture interest and income tax, to £8,501. There is consequently a profit of £10,984, to which is added £9,309 brought forward from last year, making a total of £20,293. The directors recommend a dividend at the rate of 4 per cent. (less income tax), requiring £10,480, and that the balance of £9,813 be carried forward. Notwithstanding the continued satisfactory expansion of the receipts of the Norwich Electric Tramways, the increase in expenditure—mainly in wages—resulted in a decrease in the net revenue. In view of the large amount required for the reconstruction of the track and renewal of equipment, the directors considered it wise to pass the dividend and to transfer the whole balance of profit to reserve. The Douglas Tramways Company has resumed payment of dividends. The directors refer with deep regret to the death of their colleague, Mr. Reginald J. West, which occurred on May 11.

BIRMINGHAM CORPORATION TRAMWAYS.—The annual report states that the receipts last year again constituted a record in the history of the undertaking, amounting to £1,656,654, an increase of £277,950. This was largely due to the increase of fares which took place last July. The revenue accounts of tramways showed a gross profit of £327,711, and that in respect of the motor omnibuses of £9,016, to which had to be added £1,466 in respect of interest and sinking fund instalments on feeder cables, etc., the total amount standing to the credit of the profit and loss account being £338,193. From that amount had to be deducted £167,031, leaving a balance of £171,162, which had been transferred to the reserve fund. The number of passengers carried last year was 218,222,927, a decrease of 7,000,000 compared with the previous year. The car miles run were 16,404,585, the average number of miles per car per day being 82·83. The average traffic revenue per car mile was 24·136d., the average working expenses per car mile 19·442d., and the percentage of working expenses to receipts 80 per cent. The department owns 636 tramcars and 46 motor omnibuses, the total capital expenditure being £2,717,908.

BRITISH ELECTRIC TRACTION COMPANY, LIMITED.—The increase in the ordinary dividend last year from 3 to 4 per cent. has been maintained for 1920-21. The accounts for the year ended March 31 last should be satisfactory to the shareholders. The gross profit amounted to £264,772, which compares with £246,717 in the previous twelve months, but the general expenses at £44,575 were higher, and the net revenue before deducting debenture interest was consequently only £8,900 more at £220,197. After deducting debenture interest, the balance was £285,483, compared with £254,300 last year. Preference and ordinary dividends absorbed £95,815, and of the balance, £12,349 is placed to reserve (which will then stand at £500,000), and £177,318 is carried forward, which compares with £150,421 brought from last year. Investments, which now stand at £3,861,816, yielded a revenue of 5·39 per cent. for the past year on the amount at which they appear in the balance sheet, as compared with 5·28 per cent. for the preceding year. The report states that Mr. J. S. Austin was appointed chairman of the company in July last when that position was vacated by Mr. E. Garcke. Mr. Garcke, who retained his seat on the board, has since been appointed deputy chairman of the company.

ELECTRIC CONSTRUCTION COMPANY, LIMITED.—The report for the year ended March 31, 1921, shows that the net profit, after providing for debenture interest and £10,000 for depreciation, amounts to £83,110. Including the amount brought forward (£39,781) and deducting the balance of excess profits duty for the year ended March 31, 1919, and provision for the year ended March 31, 1920 (£15,148), there is a balance of £107,743. Interim dividends have been paid on the 7 per cent. preference shares (£2,197) and 6 per cent on the ordinary shares (£9,000), both less income tax, leaving a balance of £96,546. The directors recommend the following appropriation of this balance—A final dividend at the rate of 7 per cent. per annum on the prefernece shares (£2,197), a final dividend at the rate of 9 per cent. per annum on the ordinary shares, making 7½ per cent. for the year (£13,500), a bonus of 2½ per cent. on the ordinary shares (£7,500), all under deduction of income tax, and a transfer to the general reserve fund of £19,851 (which will then amount to £120,000), leaving £53,498 to be carried forward, subject to liability for excess profits duty for the year ended March 31, 1921. The directors state that the turnover has been greater than in any previous period, and a corresponding increase is shown in the balance of net profit. Recently, however, orders have been difficult to obtain in consequence of the unsettled industrial conditions. The directors refer with regret to the death of their colleague, Sir James Pender, who had been a member of the board since the formation of the company.

IMPERIAL TRAMWAYS COMPANY.—The report for the year ended December 31, 1920, shows that there is an available balance of £24,840. After payment of interest on the debenture stock for the whole year, and interim dividend on the preference shares for the half year to June 30 last, amounting together to £13,650, it is proposed to appropriate the balance as follows—Final dividend at 6 per cent. per annum on the preference capital (less income tax) paid January 1, last £4,200; dividend for the year at 4 per cent. on the ordinary capital (less income tax), £5,600; and to carry forward to the next account £1,390. The Middlesbrough, Stockton, and Thornaby Electric Tramways shows gross receipts of £140,447, as compared with £114,259 for the previous year, an increase of £26,188, and the net profit for the year £19,405, as compared with £14,498. The total number of passengers carried was 15,626,562, an increase of 667,061. In connection with the acquisition of the undertaking by the Corporations of Middlesbrough, Stockton, and Thornaby, the arbitrator, Sir Robert Elliott-Cooper, K.C.B., awarded the company sums which, including the item of consumable stores, amounted in the total to £415,380, and also directed that the Corporations should pay the costs of the arbitration. The undertaking was transferred to the Corporations on April 2 last. The holding of the Imperial Company in the London and Suburban Traction Company remains as hitherto. For the year 1920 the revenue of the latter company was again insufficient to enable the payment of any dividend.

NOTTINGHAM CORPORATION TRAMWAYS.—The annual report shows the receipts amounted to £403,114, an increase of £24,167, or 14d. per mile over the previous year. The working expenses—including income tax—amounted to £365,361, an increase of £71,137, or 3·02d. per mile, leaving a balance of £37,752, compared with £84,723 last year. After meeting the usual charges, £655 is left to be carried to the reserve and renewals fund. The principal increases in expenditure were—Salaries and wages, £31,864; rates and taxes, £15,719; electric energy, £8,215; permanent way repairs, £7,048; petrol for motor omnibuses, £2,279; uniforms, £2,253; car and omnibus repairs, £1,531. Decreases in costs of compensation, car and depot lighting, separation allowances, and other items of expenditure amounted to £1,828. Of the increase in salaries and wages, £24,871 was caused by the higher rates paid to the traffic staff, and £6,993 by increased car mileage and omnibus services. Three motor omnibuses were put into service early in the year, and although they have proved a great convenience, the committee regret to report a loss in running expenses alone of £1,093, caused partly by the abnormal price of petrol. Against this loss must be set off the value of the omnibuses in acting as feeders to the cars. Some five miles of single tramway track were entirely relaid at a cost of £54,799, which was charged to the reserve and renewals fund. This fund, including the year's interest on investments, now amounts to £50,493. The accidents reserve fund has been increased to £10,253. The number of passengers carried was 62,166,373, an increase of 3,416,719 over the previous year.

LEEDS CITY TRAMWAYS.—The report of the general manager, Mr. J. B. Hamilton, for the year ended March 31, 1921, gives as usual an interesting and comprehensive survey of the operations of the department for the past year. The pamphlet comprises 54 pages and includes numerous diagrams, showing at a glance the essential features of operation. There is also a large outline map, with a scale of one inch to a mile, showing the tramway and railless systems at Leeds, Bradford, Batley, Dewsbury, Wakefield, Halifax, and Huddersfield. A full summary of the accounts, comparing the figures for 1920 and 1921, was given in our issue of June 16, but it may be mentioned here that the receipts amounted to £995,637, an increase of £119,111 or 13·59 per cent. The earnings per car mile were 23·48d., an increase of 2·19d. compared with the previous year. Mr. Hamilton remarks that this increase is entirely attributable to the second advance in fares, which took effect on June 3, 1920, when all the fares exceeding 1d. were increased. The working expenses amounted to £729,345, an increase of £122,998. The increase in working expenses thus exceeded the increase in revenue by £3,887. The average expenses per car mile were 17·2d., as compared with 14·725d. for the previous year, and the percentage of working expenses to receipts rose from 69·17 to 73·25. The principal cause for the increase in expenses lies in the higher rate of wages paid to the employees. The wages bill aggregated £519,352, an increase of £113,067, or 27·82 per cent. The number of passengers carried was 138,621,331, or an increase of 2,054,320. It is calculated that the population, taken as 580,000, travelled an average of 239 times as against 235 last year.

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LONDON COUNTY COUNCIL TRAMWAYS.

REPORT FOR THE YEAR 1920-21 AND ESTIMATES.

Two important financial statements were presented at the meeting of the London County Council, one on the working of the tramways during the past financial year and the other containing the estimates for the coming year. The report of the working for the year ended March 31, 1921, as prepared by the comptroller of the Council, together with a memorandum by the general manager, is summarised below.

The tramways owned by the Council extended on March 31, 1921, over a total route length of 143·57 miles (excluding 2·79 miles in Harrow Road worked by the Metropolitan Electric Tramways, Ltd.). The entire mileage (146·36) is worked by electric traction, 122·04 miles being on the conduit, 24·32 on the overhead system.

The total income from the undertaking for the year 1920-21 and the working expenses, as compared with last year, were :—

	1920-21.			1919-20.		
	£	s.	d.	£	s.	d.
Income	4,904,426	15	11	4,295,846	3	4
Working Expenses	4,623,653	15	4	3,680,909	2	6
Surplus on working	280,773	0	7	614,937	0	10
Less Expenditure on renewals	215,638	15	4	—		
	65,134	5	3	614,937	0	10
Deduct Charges against surplus on working—						
Interest	262,443	5	6	248,491	0	6
Redemption	328,221	16	10	426,833	2	9
Interest on overdraft ...	23,321	15	7	—		
Income-tax	125,000	0	0	117,646	6	0
Other charges	4,898	12	4	4,565	5	3
	743,885	10	3	797,535	14	6
Less Tax retained from interest on debt	76,881	15	0	73,579	14	8
Rent on surplus properties	5,395	17	6	—		
Recoverable debt charges ...	5,894	0	0	8,296	14	6
	88,171	12	6	81,876	9	2
Net charges against surplus ...	655,713	17	9	715,659	5	4
Deficiency for year	590,579	12	6	100,722	4	6

Percentage of surplus on working to total receipts was 5·7 (previous year 14·3), and the percentage of surplus on revenue account to total receipts was 1·3.

Particulars of the passengers carried, receipts and expenses, etc., for earlier years, are appended —

Year ended March 31.	Route Length. Miles.	Average Passenger Receipts per Route Mile.	Average Working Expenses per Route Mile.	Total Number of Passengers Carried.	Gross Receipts.
		£	£		£
1912 ...	127·55	17,498	10,571	516,092,489	2,231,902
1913 ...	132·49	16,179	11,021	501,102,149	2,143,559
1914 ...	136·62	15,967	11,603	516,338,859	2,181,344
1915 ...	140·66	16,516	11,974	547,253,332	2,323,130
1916 ...	141·52	16,097	11,897	545,247,747	2,278,115
1917 ...	141·67	17,479	12,830	586,127,976	2,476,309
1918 ...	141·67	20,206	15,026	593,516,141	2,862,554
1919 ...	141·67	24,487	20,177	636,157,361	3,469,165
1920 ...	141·70	29,418	25,977	685,124,156	4,168,512
1921 ...	143·57	33,221	32,205	689,452,036	4,769,477

The debt outstanding, after allowing for debt repaid, sinking fund balances, and value of surplus land, was £8,342,587 ; and the total amount of debt repaid up to March 31, 1921, was £6,343,285. Capital expenditure to the amount of £2,024,687 has become obsolete owing to the electrification of the horse tramways. The debt in respect of this expenditure has been reduced by the ordinary process of repayment and by proceeds of sales to £831,579.

The total sum paid to Metropolitan borough councils and the City Corporation as rates on the permanent way amounted in the year 1920-21 to £140,830, a sum which represents an average relief to the rates of London levied by the road authorities of nearly ¾d. in the £. It is estimated by the Council's officials that the saving to the road authorities owing to the maintenance of the paving along the tramway routes by the Council is about £253,000 a year. Including debt charges on street improvements, amounting to £28,222, together with the sum estimated at the end of the year to be saved to local authorities on maintenance of paving, at the rate of £253,000 a year, gives a total of approximately £422,000, and various rates were consequently relieved to this extent.

The deficiency on the working of the tramways for the year 1919-20 amounted in all to £400,000, and this sum was raised in the special county rate for the second half-year 1920-21, while the balance of the deficiency for the year is being raised in the special county rate for 1921-22.

THE ANNUAL ESTIMATES.

The Highways Committee submitted the annual estimates of the tramways for the year ending March 25, 1922. In these estimates provision is made for only half of the cost of renewals of trackwork, the other half being charged to capital account. The Treasury has assented to this course for the year on the understanding that the Council will take steps to secure a return next year to the normal practice, under which the cost of renewals is met out of revenue.

The following is a summary of the estimated results for the year 1921-22—Total receipts (including advertisement rents, etc.), £5,496,130 ; total working expenses (including one-half cost of renewals), £4,847,230 ; surplus on working, £648,900. After deducting debt charges (£353,636 for repayment of capital and £297,291 for interest on capital expenditure), amounting to £650,927 ; income-tax (less tax deducted and retained from interest paid), and net expenditure on surplus property and sundry items, £5,390, there is an estimated net deficiency of £7,417.

It is estimated that the passenger receipts will average 22d. a car-mile on a mileage of 58,500,000, and the working expenses (excluding special charges, but including half cost of renewals) will amount to 19·77d. a car-mile.

The number of passengers carried and the car-miles run, and the passenger receipts a car-mile and working expenses during recent years, and the estimated figures for the current year, are appended —

Year.	Passengers Carried.	Miles Run.	Passenger Receipts per Car-mile.	Working Expenses per Car-mile.*
			d.	d.
1912–13 ...	501,102,149	52,886,623	9·73	6·62
1913–14 ...	516,338,859	58,572,356	8·94	6·50
1914–15 ...	547,253,332	58,706,161	9·50	6·89
1915–16 ...	545,247,747	47,867,176	11·42	8·44
1916–17 ...	586,127,976	49,478,973	12·01	8·82
1917–18 ...	593,516,141	49,189,886	13·97	10·38
1918–19 ...	636,157,361	48,052,801	17·33	14·27
1919–20 ...	685,124,156	53,156,060	18·82	16·62
1920–21 ...	689,452,036	57,488,232	19·91	19·30
1921–22 ...	691,000,000	58,500,000	22·00	18·97

* Excluding cost of renewals.

The total capital expenditure up to March 31, 1921, for purchase, reconstruction, and extension, etc., was £14,475,451, and the total debt incurred was £14,816,985. The net debt outstanding was £8,342,587. The amount included in the estimates for 1921-22 for redemption of debt is £353,636 (1920-21, actual £328,222).

The estimates of expenditure on capital and on revenue accounts for the financial year 1921-22 are as follows—

CAPITAL ACCOUNT. — Purchase of tramway undertakings, £235,000 ; power supply, £188,655 ; construction and reconstruction of tramways, £900,660 ; renewals of trackwork (half cost), £226,250 ; contingencies, £40,000 ; total, £1,590,565.

REVENUE ACCOUNT.—Power expenses, £627,015 ; traffic expenses, £2,115,155 ; advertisement expenses, £19,720 ; repairs, £1,275,010 ; renewals, £228,950 ; general expenses, £372,170 ; special charges, £28,850 ; total, £4,666,870.

Adding £100,000 for miscellaneous expenses, there is a total estimated expenditure, including provision in other votes, but excluding debt charges of £111,090, of £4,766,870.

Included in the estimates of capital expenditure for next year are the following items—Purchase of London United Tramways, £235,000 ; new tramcars and equipment of cars, £384,485 ; half cost of renewals of trackwork, £226,250 ; reconstruction of Burdett Road route, £155,000 ; erection of central repair depot, £131,175. The purchase money for the London United Tramways undertaking is payable not later than twelve months after the declaration of peace, so that it is possible that the payment may not fall within the present financial year. Half the cost of renewals of trackwork is, with the permission of the Treasury, and as noted above, being charged to capital account up to March 31, 1922, but it is expected that a return to the normal practice will be made in the following year.

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TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDEEN.

NEW AGREEMENT—NUMBER OF INSPECTORS.

A new agreement has been drawn up between Aberdeen Corporation and the Aberdeen Suburban Tramways Company. This provides that the Suburban Company's cars are allowed to run over the Corporation lines on condition that the company hands over to the Corporation all receipts drawn while the company's cars are on the Corporation track. In return the Corporation are to pay to the company wages, maintenance, and superintendence allowances at the company's own scale, and in addition a sum of 1¾d. per car-mile run over the Corporation lines. Formerly the wages, maintenance, and superintendence allowances were paid to the company at the Corporation rate, which was much higher than that of the company. The new allowance of 1¾d. per car-mile is intended to compensate the company for the difference. Councillor D. W. Beaton, convener of Aberdeen Corporation Tramways Committee, replied to certain local critics of the undertaking at a Ward Committee meeting on June 17. The suggestion had been made, he said, that the number of tramway inspectors should be cut down. What interested him was that the "cut" in the car service had cost them more in the month than would have kept all the inspectors for four years—practically £10,000. It was much more important that Ward Committees should have been up against the Council for the "cut," because if every other town in Britain could run cars so could Aberdeen. They had only fourteen inspectors in Aberdeen—including the chief inspector, the motor inspector, six ticket inspectors, three traffic inspectors, and two relief inspectors—which was one inspector for every nine cars. The majority of other cities had one inspector for every five cars. A vote of confidence in the Ward's representatives on the Town Council was passed.

BELFAST.

£200,000 RECONSTRUCTION CONTRACT.

The City Council, at a special meeting on June 15, approved the recommendation of the Tramways Committee based on the advice of the general manager (Mr. J. S. D. Moffet) giving the contract for the reconstruction of about eleven miles of track to the Consolidated Construction Co. Ltd., of London, at a sum of £197,873 14s. 3d., plus £2,750 for the five years' maintenance, making a total contract price of £200,623 14s. 3d. Other tenders submitted were—Mr. John Graham, Dromore, construction £237,970, maintenance after completion £21,500, total £259,470; Messrs. J. and W. Stewart (Belfast), 12, Berkeley Street, London, W.1, construction £179,901 18s. 4d., no figures quoted for maintenance; Messrs. J. P. Trentham, Ltd., Winchester House, Victoria Square, Birmingham, £196,530 8s. 4d. for construction, etc., and £7,700 for maintenance, total £204,236 8s. 4d.

Councillor W. G. Turner (chairman of the Tramways Committee) pointed out that there would be no interruption of the car services during the work of reconstruction. This would proceed at the rate of half a mile per week, and the ordinary labour would be drawn from unemployed ex-serviceman with twelve months' residence in the city. The maintenance work would extend over a period of five years from the completion of the reconstruction work. One of the conditions was that the materials must be of the finest quality and of British manufacture. The concrete foundations would be at least two inches deeper than the present ones, and all bad parts would be reinforced. He added that the cost would be at least four times that of the existing track.

BIRMINGHAM.

STATIONARY CAR BY-LAW—TERMINUS IMPROVEMENT.

Some time ago the Corporation took steps with a view to the adoption of a by-law requiring every driver of a vehicle intending to pass on the near side of a stationary tramcar to draw up until the roadway was clear of passengers. The Corporation have since received a communication from the Ministry of Health to the effect that they have been in communication with the Ministry of Transport, but it is considered that such a by-law, restricting ordinary traffic for the benefit of tramway traffic, could not be justified. The Ministry thought it would be an arbitrary distinction to require vehicles to halt by the side of a tramcar and not by any other obstacle in the road. An improvement is in progress at the Martineau Street terminus of the Corporation Tramways. The footpath is being widened to allow for the erection of loading barriers, and the car lines are being diverted from the centre of the road to the edge of the pavement.

BLACKPOOL.

INCREASED FARES.

The Town Council have approved a revision of fares and contract rates on the Corporation Tramways, involving several increases. The through fare between Blackpool and Fleetwood is raised from 8d. to 9d. The issue of reduced fare tickets is discontinued. The contract ticket rates on the Leyton route are increased from £2 to £3 10s., and on all other routes within the borough by 50 per cent.

BOURNEMOUTH.

THE FARES INQUIRY.

With reference to the adjourned inquiry into the Council's application for permission to raise tramway fares, the chairman of the Tramways Committee (Councillor J. Wilson), the vice-chairman (Councillor W. H. Ridout), and the Mayor were appointed as a sub-committee to confer with the Poole Council on the matters between the two Councils.

BURNLEY.

REDUCED WORKING COSTS.

In a report on the relaying of the permanent way, Mr. H. Mozley, the general manager of Burnley Corporation Tramways, mentions that there are important reductions in the cost of material and wages, namely, 2d. per hour on wages, pitch £6 per ton less, and cement £1 3s. per ton less.

BURTON AND ASHBY.

LIGHT RAILWAY WAGES.

Sir Eric Geddes, in reply to a question in the House of Commons, in regard to the wages paid on the Burton and Ashby Light Railway, said this light railway was the property of the Midland Railway Company, whose net receipts are at present guaranteed by the Government. The line is, however, regarded as a tramway and not as a railway undertaking, and the railway wages award has not been applied to the employees of the light railway. He understood, however, that the wages and conditions of the men were agreed between their representatives and the Midland Railway Company.

GLASGOW.

ACTION OVER DAMAGED CAR—EMPLOYEE'S INVENTION—PAISLEY TRAMWAYS.

A case of much interest to tramway authorities has come before the Sheriff Court. Sheriff Thomson has issued his interlocutor in an action at the instance of Glasgow Corporation against Messrs. Wylie and Lochhead for £147 in respect of the loss of use of and the cost of repairing one of their tramway cars which had been in collision with a motor lorry belonging to defenders. The defenders admitted liability for the occurrence, and offered to pay the cost of repairing the car, but disputed the item for loss of use, and contended that such a claim was irrelevant. Sheriff Thomson held that the Corporation are entitled to recover any loss sustained by them through the tramway car having been taken off the route for repairs. He pointed out that the Corporation, as owners of the tramway system, are as much entitled to damages for the loss of use of one of their vehicles as the owner of a single vehicle. Mr. William Dickie a coachbuilder in the Corporation Tramway Department, has patented an improvement on the lifeguard used on the cars, and as it has worked satisfactorily the committee recommend that a grant of £200 be made to him for out-of-pocket expenses, and to cover the cost of protecting the patent for 14 years, on condition that the Corporation be allowed to use the patent. The sub-committee appointed by the Corporation of Glasgow to report on the proposal to acquire the Paisley District Tramways have visited Paisley. They proceeded over the system and inspected the plant and workshops of the local company.

GREAT YARMOUTH.

MUNICIPAL INSURANCE FUND.

At a meeting of the Corporation on June 14, it was stated that nine years ago the Council established a fund for third-party and workmen's compensation insurance, beginning business with £2,223, a portion from the general district rate, and £970 from the tramways. The premiums were those which would be paid to an insurance company. The committee having charge of the fund had adjudicated on many claims, all of which had been met to date. As a result of the nearly ten years' trading they had accumulated a profit of £5,059 18s.

HUDDERSFIELD.

TRACK WORK AIDS UNEMPLOYED.

The Tramways Committee have received authority for the laying of a double line of track in lieu of the existing single line in Halifax between Holly Bank Road and Thornhill Road. The work has gone on day and night in order to provide work for the unemployed.

KESWICK.

PROPOSED LIGHT RAILWAY.

A scheme for a light railway between Keswick and Ambleside has been referred by Westmorland County Council to the Main Road Committee. The proposed railway would run between the head of Windermere Lake and Keswick Station, on the Keswick to Cockermouth branch of the London and North-Western Railway, by way of Grasmere and Thirlmere, crossing Dunmail Raise by

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means of special engines. Five lakes would be seen en route. Wagons and carriages on the existing rails could be run through to Ambleside. The length of the line would be 16 miles, and the estimated cost £150,000. Petrol-electric engines would be employed.

LEEDS.

TRAMCARS AND MOTOR COACH COMPETITION.

Public interest in Leeds was aroused by a controversy between the local proprietors of motor coaches and the City Tramways Committee over competition between motor coaches and the tramcars. Although the coach proprietors were authorised by the Tramways Committee to ply for hire in the city when the tramway service was severely curtailed a short time ago, there has been a tendency on the part of the proprietors to continue to run the coaches now that the tramway service has been restored practically to normal. The chief route where the motor coaches have been busy is that from Roundhay Park at night. The coaches have been charging 6d. per head to the city, and although this is 2d. more than the tramcar fare, many people have preferred the motor vehicle rather than wait in the queue for a car. The tramway authorities contend that such competition is against the by-laws, and point out that it is unfair for motor coaches to step in and reap benefit during the profitable hours, while the tramcars have to maintain a service during the slack parts of the day as well. On the other hand, the coach proprietors assert that they are acting within their rights and are meeting a public demand.

LIVERPOOL.

CHEAP FARES FOR CHILDREN.

The Corporation Tramways Committee have authorised the trial of an experiment during July whereby children under the age of fourteen will be allowed to travel on the tramcars any distance at a twopenny fare, except between the hours of twelve noon and two. The purpose is to give cheaper facilities to children during the school holidays to travel on the cars to and from the parks.

LONDON.

NEW RAIL SECTION—SERVICE IMPROVEMENTS—DRIVER CHARGED.

At a meeting of the County Council on June 7, the Highways Committee reported that, since the advertisement inviting tenders was issued, a new section (No. 8) has been determined upon by the committee of the Engineering Standards Association to supersede the standard track rail section No. 4, which, with certain modifications, has been used by the Council since 1904. The new section weighs about 113½ lb., instead of 105 lb., and has greater stiffness in the web to meet lateral stresses, while the depth of the groove is increased. Messrs. Dorman, Long and Company, whose tender was the lowest of those submitted, had offered, if some or all of the rails were to be manufactured according to the new section, to make the new rails which would be required for an additional sum of £675, making the total of the company's tender in that event £86,231 5s. After negotiations the company had agreed to delay the delivery of 2,000 tons until August 15, 1921, and to give the Council the option up to that date to cancel the contract so far as regards the delivery of this quantity. The Highways Committee reported that they had decided to accept the tender on these conditions. Several improvements in the southern system of the London County Council Tramways came into operation on June 16. The services previously ending at Blackfriars and Savoy Street, Strand, were linked up and operated as circular routes, and the number of suburbs served by cars running the full length of the Embankment was increased. On the circular services, passengers may now travel by either route—Westminster or Blackfriars—for the lower fare. A former cause of delay, the turning of cars at Blackfriars, has ceased, and at Savoy Street the cars of only two services now turn. The midday fares of 2d. all the way, Mondays to Fridays, apply to the new services. Westminster City Council has recommended that the London General Omnibus Company's omnibuses be allowed to proceed to the Embankment *via* Horse Guards Avenue and return *via* Northumberland Avenue, in accordance with the scheme, approved by the police, for linking up tramway "dead-ends." At East Ham Police Court on June 14, Walter Charles Rayfield, aged 52, tramcar driver, was charged with being drunk while driving his car. The police stated that the car knocked down and injured a man, and it was then found that the prisoner was drunk. Rayfield, on oath, denied being drunk, but admitted having had four whiskies and soda before his dinner. Mr. Daybell, for the defence, said the prisoner served in the South African War and the European War and rose from the rank of private to lieutenant. The magistrate (Mr. Grubbe) discharged him on payment of 40s. costs.

NEWCASTLE-ON-TYNE.

POLICEMEN'S FREE PASSES.

The Watch Committee have decided to discontinue the payment to the Transport and Electricity Committee of £500 a year for allowing policemen in uniform to ride free on the city tramcars. The payment of £500, which is to end in February next, has only been in operation three months.

OLDHAM.

DEVELOPMENT OF LOCAL CAR SERVICE.

As the result of the purchase by the local municipalities of the Oldham, Ashton and Hyde Electric Tramways, notable developments in the service are contemplated. At a meeting of Denton District Council, Councillor A. Brown said Manchester Corporation was taking over running powers throughout the district, and would couple up between the Crown Point, Denton, and the line of tramways running behind, making a through service from Manchester to Hyde. The whole track would, however, have to be relaid. For the present, as a temporary arrangement, the Stalybridge and Hyde Joint Board would run to Crown Point from Hyde, and the Ashton Corporation would run from Oldham to Denton.

TAUNTON.

PROTEST AGAINST TRAMWAY STOPPAGE.

A public meeting was held to protest against the closing down of the tramway service owing to the Electric Traction Company being unable to agree to the Corporation Electricity Committee's charge for current. Mr. F. A. Jarman, who presided, emphasised the fact that the people of the town had not been consulted before the stoppage took place. Mr. H. Bellinger, district organiser of the United Vehicle Workers' Union, proposed a resolution viewing with alarm and apprehension the withdrawal of the service. Protest was made against "the apparent lack of consideration for the needs and wants of the travelling public shown by the authorities concerned." The resolution urged that as the tramways were a public utility service, negotiations between the Corporation and the Company should be reopened. It was also suggested that a ballot of the ratepayers should be taken. Mr. W. H. H. Spencer, a member of the Corporation, remarked that the £600 per annum paid by the company did not represent the cost of the electric current supplied. On the contrary, the ratepayers for some time had to make up a deficiency of £400. He considered the Corporation adopted the only possible course in the circumstances, and that with the provision of a motor omnibus service in the town, the removal of the tramcars would not seriously inconvenience the public. Mr. C. Webber, chairman of the Finance Committee of the Council, alluded to a suggestion that the Corporation should take over the undertaking. He said the purchase money of £7,000 would have to be borrowed, and repaid with interest over a number of years. That would mean a charge on the rates of from £500 to £700 a year, representing a 2d. rate. The resolution of protest was carried.

SOUTHPORT.

AN ECONOMICAL INNOVATION.

Instead of renewing the worn-out underground cables, the Town Council have decided to reinforce the tramway standards with a view to carrying the feeders overhead. It is anticipated that this will effect a saving of several thousands of pounds.

SUNDERLAND.

NEW CARS.

The English Electric Company, Ltd., are supplying 12 saloon deck and vestibule cars to Sunderland Corporation. The cars, some of which have been put into service, are provided with front exits.

TORQUAY.

TRAMWAY DEPOT DESTROYED.

The large depot of the local tramways company in St. Marychurch Road was destroyed by fire on Friday, June 3. The explosion of a barrel of petrol was believed to be the cause, and the damage was estimated at £20,000.

WIGAN.

CORPORATION UNSUCCESSFULLY SUED.—APPOINTMENT OF MANAGER.

At Manchester Assizes, on June 2, before Mr. Justice Acton, Messrs. Lewin and Camber, oriental carpet merchants, sued the Corporation of Wigan for £275 for damages alleged to have been sustained by their motor car in collision with a tramway car in Ormskirk Road, Newtown, on July 16 last year. The defendants denied liability. It appeared that plaintiffs' car had been forced to stop on the tramway track, and before it could get clear the tramcar collided with it. His Lordship did not find negligence on the part of the tramcar driver, and gave judgment for the Corporation, with costs. The Tramways Committee have selected Mr. W. M. Milnes, assistant manager and engineer of Coventry Corporation Tramways, for the position of general manager of the Wigan tramways, subject to the approval of the Town Council. The appointment, which was rendered vacant by the departure of Mr. Ben Hall, carries a salary of £700 per annum.

WOLVERHAMPTON.

HIGHER FARES AUTHORISED.

An interim order of the Ministry of Transport authorised the increase of tramway fares to 1½d. per mile, with a 2d. minimum, but its operation was deferred owing to the present industrial position.

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PERSONAL.

Councillor J. Cavey is the new chairman of the Tramways Committee of Wigan Borough Council.

Councillor I. J. Curwen has been appointed chairman of Lancaster Corporation Tramways Committee.

Mr. G. Richards, chief engineer of the Indian State Railways, has been appointed chief engineer of the Railway Board.

Mr. J. W. Hame, electrical engineer and tramways manager to York Corporation, has been granted an increase of salary to £900 per annum.

Mr. Norman Scorgie, the borough engineer of Hackney, has been elected president of the Institution of Municipal and County Engineers.

Lieut.-Colonel C. Barber has been appointed general manager of the Delhi Electric Tramways and Lighting Company, in succession to Mr. J. G. Griffin.

Messrs G. W. Stubbings and **S. H. Wigner** have been appointed technical assistants in Grade 2 of the electrical branch of the London County Council's tramways department.

Mr. A. S. Bayley, O.B.E., manager of the Nottingham Railway Carriage and Wagon Works of Cammell Laird and Company, Ltd., has been appointed a director of the company.

Mr. J. G. Griffin has resigned his position as general manager of the Delhi Electric Tramways and Lighting Company, Ltd., and his services have been retained by the company as consulting engineer in London.

Mr. Harold E. Webb has been appointed London office manager by Bruce Peebles and Co. Ltd. Mr. Webb has a long connection with the company, and is well known to their many customers in the London area.

Mr. Frank Ayton, general manager and electrical engineer of Ipswich Corporation Tramways, has resigned this position. He is leaving municipal service, and has been offered, and has accepted, the position of joint managing director of Messrs. Ransomes, Sims and Jefferies, Ltd.

Mr. John Bunting, who has been associated with Bruce, Peebles and Co. Ltd., for over twenty years, is severing his connection with that firm to join the Ateliers des Construction Electriques de Charleroi, and will open a branch office of the company at 56, Victoria Street, Westminster, S.W.1.

Mr. Arthur T. Smith, A.M.I.E.E., of Albion House, Hanley, Stoke-on-Trent, has been appointed agent in the Midland Counties of England by Bruce Peebles and Co. Ltd., for the sale of their electrical machinery. The counties covered by the agency are Stafford, Derby, Nottingham, Lincoln, Rutland, Leicester, Warwick, Worcester, and Salop.

Alderman Frank Wyatt, of Wolverhampton Town Council, who is a strong advocate of the use of motor vehicles for municipal purposes, recently presided at a meeting in Wolverhampton, called for the purpose of forming a district committee of the Commercial Motor Users' Association. The scheme was strongly supported, and a provisional committee was appointed.

Mr. Felix J. C. Pole, who was recently appointed general manager, of the Great Western Railway in succession to Mr. Charles Addington, C.B.E., began service in the telegraph department at Swindon as a boy clerk when 14 years of age. He successively passed through the departments of the electrical engineer and the civil engineer at Paddington, and became assistant general manager in 1910. Mr. Pole is 43.

Mr. Robert Nimmo, who recently retired from the position of building superintendent of Liverpool Corporation Tramways, has been presented with a gold watch, silver cigar case, and smoker's cabinet by the staff. In making the presentation, Mr. P. Priestly, the general manager, said Mr. Nimmo had been connected with the Liverpool tramways system for over 50 years, having been employed by the old tramways company. He had assisted in the change over from horse to electric traction, and was held in the highest esteem by all with whom he came into contact, who appreciated his conscientious work.

Dr. Walther Rathenau, formerly of the German General Electric Company, and the new Minister of Reconstruction, is one of the most prominent industrialists in that country, and before the war was well known in British electrical engineering circles. According to the *Times* Berlin correspondent, Dr. Rathenau is a son of Emile Rathenau, the founder of the Allgemeine Elektricitats Gesellschaft. After studying mathematics, chemistry, and physics at the Berlin University, he went in for research work, and made some discoveries in electrotechnics that enabled him to start factories of his own. Later on he joined the A.E.G. The various undertakings that have grown out of the parent firm form to-day a huge trust, of which he is managing director, with ramifications into many branches of industry.

CONTRACTS AND ORDERS.

York Corporation have accepted the tender of Callender's Cable and Construction Company for cables.

The English Electric Company have an order from Blackburn Corporation for two rotary converters and switch gear.

W. T. Henley's Telegraph Works Company's tender for the supply of cables at £32,065 has been accepted by Sydney (N.S.W.) Council.

Leeds City Tramway Committee have accepted the tender of Tramways Supplies, Ltd., for sub-station switchgear at £943 10s.

The Metropolitan Vickers Electrical Company are supplying E.H.T. switch gear for the Jubilee Street generating station of Blackburn Corporation.

Hull Tramways Committee have accepted the tender of Walter Scott, Ltd., for 250 tons of rails at £19 per ton ; 15 tons of fishplates at £26 per ton ; and 10 tons of sole plates at £26 per ton.

Glasgow Tramways Committee have accepted the tenders of Cochran and Co. (Annan), Ltd., for a boiler for Langside Depot ; and the Metropolitan Vickers Electrical Co. Ltd., for magnetic brake equipments.

Ransomes, Sims and Jefferies, Ltd., of Ipswich, have received a repeat order for two standard 3½-ton tipping wagons for refuse collection from the Health Department of Barrow-in-Furness Corporation. Ipswich Corporation has also given an order for two 3½-ton tipping wagons.

Walker-Weston Reinforcement System.—The Walker-Weston patent system of reinforcement, manufactured by the Walker-Weston Co. Ltd., of Empire House, 7, Wormwood Street, London, E.C.2, is specified under the contract for the reconstruction of the Belfast Tramways, which has been assigned to the Consolidated Construction Company, Ltd.

The Electricity Commissioners of Victoria, Australia, have placed an order with the Metropolitan Vickers Electrical Company for five 12,500 KW. three-phase turbo-alternators at £300,000. These machines will generate current at 6,600 volts, 50 periods, at 3,000 revolutions per minute. The first set is to be completed in eleven months and the entire order in seventeen months.

The Victorian Electricity Commissioners received six tenders, all from British manufacturers, for two turbo-generators for the Newport power-house. They accepted the tender of C. A. Parsons and Co. Ltd., for the manufacture and delivery of two 15,000 KW. turbo-generators at £100,000, the plant to be delivered and erected within eighteen months. The commissioners expect to have the new power-station in operation by the summer of 1923. Merz and McLellan are the consulting engineers.

MILLARS' NEW MACHINE DEPOT.

Millars' Timber and Trading Co. Ltd. have acquired a large new machinery depot for the storage and exhibition of their well-known time-saving construction plant at Kirtling Street, Nine Elms Lane, Battersea, S.W.1. The firm, whose city offices are at Pinners' Hall, E.C.2, previously had their depot at Purfleet, Essex, but the new site is much more convenient and central. Several large, roomy buildings adjoining the Lambeth Goods Depot of the Great Western Railway have been taken over for the Metropolitan Water Board, and the floor space available is about 50,000 square feet. The floors are of cement and the roofs are partially constructed of glass, which affords adequate light for working and the inspection of goods. A basement runs under the whole length of the main block, and is used as a repair shop and stores.

Outside the warehouses is a large flat demonstration ground adjoining the Thames. Here, on June 14 and 15, when the depot was opened, representatives of the technical press and other visitors were able to see various types of Millars' mechanical appliances at work under the guidance of Mr. Ivan Benson, manager of the machinery department, and Mr. Richwood, assistant manager. Qualities of utility, speed, easy manipulation, and efficiency were clearly apparent in all the machines. The samples included the Osgood revolving steam shovel, the 8-ton Springfield tandem steam roller, Millars' 25 H.P. tructractor, which, in addition to its own automatic bin, was pulling a Watson bottom dumping wagon, and a petrol-driven concrete mixer.

In the exhibition shops the visitors were invited to inspect a large selection of diaphragm pumps, crushers, cranes, derricks, mixers, steel concrete carts and barrows, and portable wagon loaders. The new " Haiss " bag loader aroused much interest by its novel and efficient working.

The new depot is excellently situated for transport purposes, the river and several railways being close at hand.

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RECENT PUBLICATIONS.

THE BRITISH ALUMINIUM COMPANY have issued a new and revised edition of their informative little pocket book, "Aluminium Facts and Figures." The loose-leaf principle to allow of the addition of future data sheets will be appreciated.

Q-FEL RAIL CLEANERS.—George W. Green & Co. (Feltham) Ltd., of Feltham, Middlesex, have published a new booklet descriptive of their well-known rail cleaners. It is pointed out that the cost of work by the Q-Fel cleaner is about £1 10s. per 1,000 track miles—considerably less than by hand labour. Another new pamphlet issued by the firm deals with Q-Fel section insulators.

THE J. G. BRILL COMPANY, Southampton Row, London, W.C., have issued as a 4-page circular a reprint of the article by "Fare-getter" on "Graded Fares for One-Man Cars," which appeared in our issue of June 16. On the first page of the pamphlet is a striking photograph of a view on Wabash Avenue, Terre Haute, Indiana, showing the facility with which lightweight one-man cars are manœuvred.

TRAMWAY TRACK WORK is the title of a new edition of the Technical Pocket Book, 1921, issued by Edgar Allen and Co. Ltd., of Sheffield. This contains, as usual, a variety of useful information, including illustrations and specifications of Allen manganese steel for points and crossings, details of easement curves, turnouts, stress conversion tables, particulars of British standard rails, fish-plates, etc.

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PATENT LIST

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in *italics*.

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Gear box control mechanism for motor vehicles (15,491)—W. Blair.
Steering gear for motor vehicles (14,958)—British Transmission Company, Limited, R. Pentony, and A. J. Stubings.
Brakes for motor vehicles (15,207)—British Transmission Company, Limited, and C. R. Crosher.
Driving means for motor vehicles (15,542)—F. J. Brougham (*Atlas Truck Corporation*).
Gear cases of tramcars (15,285)—R. H. Dickinson and T. C. Winfield.
Speed gears for motor vehicles (15,424)—W. D. Hickey.
Rail joints (15,014)—J. Katcher and E. Smith.
Engine lubrication of motor vehicles (15,064)—G. H. T. Petersen.
Frictional transmission for motor vehicles (15,119)—J. D. Roots.
Transmission gear for motor vehicles (15,508)—J. S. Wilkerson.
Speed gears for motor vehicles (16,086)—E. Atkinson and J. Sadler.
Suspension device for overhead conductor wires (15,940)—Sir P. Dawson and F. W. Fawdry.
Folding steps for motor omnibuses etc. (16,137)—J. W. Laybourn and D. T. Todd.
Steering gear for motor wagons, etc. (16,470)—Albion Motor Car Company, Limited, and T. B. Murray.
Traffic indicators for motor vehicles (16,794)—A. E. Barker.
Conductors' ticket box for tramcars, etc. (16,591)—C. Burgess and J. R. Taylor.
Ventilators for tramcars (16,796)—H. T. Dobbs.
Jacks for vehicles (16,466)—A. Merchant.
Safety brakes for motor vehicles (16,422)—T. H. Pearce.
Driving mechanism for motor vehicles (16,403)—A. E. White (*Mercury Manufacturing Company*).
Change speed gear for automobiles, etc. (17,222)—E. H. Develay.
Gear mechanism for automobiles (17,186)—W. Duckitt.
Control of electrically-propelled vehicles (17,255)—Electro-Mechanical Brake Company, Limited, and M. J. Pattison.
Life-guards for motor vehicles (17,087)—W. French.
Method of driving vehicles (16,972)—Merx, Limited (*Rahtjen* partly).
Lifting jacks, etc., and operating same by compressed air or gas (17,402)—G. A. Mortier.
Motor vehicles (17,421)—S. Oulianine and N. Schrieber.

SPECIFICATIONS PUBLISHED

1919.

Chassis of trackless tramway cars (27,471—*163,355*)—G. A. Bishop and R. A. Chadwick.
Clutch and brake locks for motor vehicles (17,183—*163,726*)—W. H. Steele and R. E. Staples.

1920.

Change speed gearing for motor vehicles (5,631—*162,849*)—W. M. Oldie.
Car truck (7,692—*140,416*)—Commonwealth Steel Company.
Combined fuel and oil tanks for motor vehicles (10,790—*162,906*)—Graiseley Motor Accessories, Limited, and J. W. Roberts.
Electric controllers for electrically-propelled vehicles (5,749—*163,153*)—P. A. H. Mossay, Mossay and Company, Limited, and Ransomes, Sims and Jefferies, Limited.
Fenders for motor vehicles (10,543—*163,194*)—B. H. Sills and Locke-Wade Company, Limited.
Means for supplying electric current to vehicles from the tracks (4,104—*163,426*)—W. T. Jones.
Motor road vehicles (4,481—*163,443*)—L. de S. Victorio.
Motor vehicles (4,593—*163,449*)—A. A. M. Durrant and T. E. C. Hirst.
Motor vehicles (4,617—*163,451*)—L. Dugdale.
Transmission arrangements in motor vehicles (4,797—*163,461*)—G. Lambert.
Direction indicators for motors (4,859—*163,465*)—C. R. Lucas.
Journal bearings for axles of tramways (5,236–*163,492*)—C. E. Adams.
Power attachments for motors (7,220—*163,527*)—E. T. Holmes.
Steering gear for motor vehicles (14,496—*143,888*)—F. L. Lord.
Motor vehicles (14,613—*143,914*)—G. A. Wood.
Arrangement of compressor for motor vehicle engines (14,644—*143,925*)—Daimler Motoren Ges.
Lifting jacks (23,209—*163,621*)—G. H. Morris.
Variable speed gear for motor road vehicles (26,041—*163,629*)—A. H. C. Adams.
Motor vehicles (4,796—*163,764*)—G. Lambert.
Life-guard apparatus for automobiles (5,108—*163,772*)—H. H. Hancock.
Safety devices for vehicles running on metal tracks (5,835—*163,811*)—C. S. Price.
Anti-vibration system for the chassis or bodies of motor vehicles (6,225—*163,826*)—R. K. Brereton (legal representative of J. W. Brereton, deceased).
Steering columns for motor driven vehicles (22,010—*152,003*)—B. J. Grigsby.
Lifting jacks (25,328—*150,720* and 25,329—*150,721*)—Lane Brothers Company.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	June 3	June 10	June 17	June 24		June 4	June 11	June 18	June 25		Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdeen Corporation	2,436	4,776	3,956	3,976	...	1,526	2,952	3,655	3,521	...	3½	10,129	– 2,579
Aberdeen Motor Buses	...	...	...	...	...	593	634	213	270	...	3½	1,117	—
Ayr Corporation	649	715	748	746	...	659	705	692	686	...	6	3.951	– 178
Barrow Corporation	826	858	879	888	...	852	864	821	887	...	12	10.688	+ 592
Belfast City Tramways	12.039	12.300	12.124	12.002	...	13.090	14.024	11.619	13.495	...	12	158.453	+ 15,822
Birkenhead Corporation	3,049	3,008	3,135	3,036	...	2,339	2,303	2.452	2.529	...	12½	30.605	– 7.271
Birkenhead Motor 'Buses	400	398	426	450	...	817	797	800	820	...	12½	8.652	+ 4,183
Birmingham Corporation	27,474	27,853	28,131	27,660	...	28,245	29,340	28,938	28,685	...	12	364,428	+ 15,917
Birmingham Motor 'Buses	2,038	2,022	2,108	2,103	...	2,143	2,286	2,212	2,177	...	12	27.095	+ 1,523
Blackburn Corporation	2,300	2,631	2,484	2,654	...	1,445	1,831	2,159	2,261	...	12½	25,951	– 6,194
Bradford Corporation	12,031	11,258	12,633	12,314	...	11 163	12,315	11,458	11,817	...	13	157,858	+ 881
Burnley Corporation	3,548	3,488	3,458	3,450	...	2,859	3,014	2,654	2,878	...	—	—	—
Burton-on-Trent Corporation ...	514	520	564	575	...	577	575	664	593	...	12	7,654	+ 698
Bury Corporation	2,834	2,560	2,712	2,745	...	1,949	2,230	2,380	2,429	...	12½	29 791	– 3,439
Chatham and District	1,864	1,749	1,821	1,864	...	1,485	1,562	1,526	1,519	...	25	40.352	+ 193
Derby Corporation	2,077	2,080	2,286	2,197	...	1,629	1,618	1,644	1,675	...	12	24,335	– 3,194
Dundee City	2,812	2,815	2,758	2,882	...	3,434	3,592	3,438	3,501	...	5½	18.876	+ 3.676
East Ham Corporation	1,868	1,849	1,979	1,974	...	2,052	2,118	2.089	2.133	...	12½	26,087	+ 3.553
Edinburgh Corporation	13,949	11,974	14,609	14,520	...	13,375	13,200	14,020	13,985	...	6	82,825	+ 1,796
Edinburgh Motor 'Buses	649	684	819	4,057	...	4,271	4,335	4,220	842	...	6	29.033	+ 24,787
Glasgow Corporation	42,290	45,108	45,395	44,957	...	51,068	50,183	49,389	48,576	...	3½	180,364	+ 20,108
Glossop (Urban Elec. Supply Co.)...	234	231	244	230	...	191	196	213	213	...	26	6.095	+ 24
Halifax Corporation	3,747	3,761	3,555	3,818	...	3,629	3,736	3,609	4,095	...	11½	47,581	+ 1,300
Halifax Motor 'Buses	105	97	91	94	...	101	100	97	101	...	11½	1.243	– 73
Huddersfield Corporation	4,975	5.084	5.189	5.322	...	5.419	5.431	5.527	5.452	...	13	68.202	+ 14.580
Ilford U.D. Council	1,238	1,202	1,304	1,261	...	1,538	1,598	1,606	1,662	...	12½	19,334	+ 3.955
Ipswich Corporation	888	895	980	949	...	724	765	779	799	...	12	9.725	– 2.048
Isle of Thanet...	1,237	1,251	1,469	1,664	...	902	1,072	1,365	1,514	...	37½	26.303	– 2.037
Kilmarnock Corporation	338	338	359	374	...	384	363	363	357	...	5½	2.181	+ 95
Leicester Corporation	6,762	6,791	7.181	6,830	...	5.001	5.657	6.180	6.611	...	—	—	—
Liverpool Corporation	28.257	28.115	28.603	28.510	...	26.797	28.152	28.885	29.566	...	25½	695.975	+ 22.384
London County Council	84,777	84,822	83.874	83.236	...	99,337	101.627	102.523	100.520	...	12	1,185.955	+ 187.520
Maidstone Corporation	480	463	483	467	...	392	415	431	424	...	11	5.684	– 133
Manchester Corporation	32.093	32.306	32.613	33.502	...	40.131	40.995	39.549	39.495	...	12	492.871	+ 148.054
Newcastle-on-Tyne Corporation ...	10,485	10.658	11.090	18.736	...	10.637	10.856	10.903	17.125	...	11½	62.565	+ 2 619
Nottingham Corporation	7.537	7.685	7,993	7,721	...	3.971	3.801	5.339	5.412	...	12	63.910	– 30.605
Oldham Corporation	5,050	4,658	4.763	5,155	...	4.672	4.587	4.596	4.692	...	14	63.567	+ 2.958
Reading Corporation	1.835	1.824	1,656	1.633	...	1 452	1,440	1.621	1,611	...	12	18.409	– 1.943
Reading Motor 'Buses	433	393	196	205	...	361	380	346	360	...	12	4.181	+ 1.334
Rotherham Corporation	2.999	2 156	1,927	2.603	...	2.017	1,994	1.955	1.992	...	11	22.771	– 5.594
St. Helens Corporation	1,886	1.971	2.050	2.114	...	1.783	1.849	1.804	1.873	...	12	21.142	– 1.954
Sheffield Corporation...	20.227	20.220	20.550	21.528	...	19.636	19.474	19.707	19.835	...	12½	241.162	– 16.456
Southampton Corporation	3,337	3.448	3,368	3,346	...	2.125	2,224	2.411	2.606	...	12	30.357	– 6,943
Southampton Motor 'Buses	219	229	219	227	...	412	426	374	284	...	12	3,546	+ 735
Southend Corporation	2.343	2.266	...	...	...	1.866	2.044	...	...	...	10	17.373	– 3.766
South Shields Corporation	1,853	1.877	2 027	2,268	...	1.565	1.585	1.587	1.822	...	13	19,374	– 3.874
Sunderland Corporation	3,002	3,040	3,232	3.374	...	2.508	2.471	2.638	2.804	...	12	30.394	– 8.181
Swindon Corporation	387	387	375	381	...	375	389	389	442	...	11½	4.752	+ 155
Tyneside Tramways and Tramroads	1,061	1.114	1.219	...	...	1.212	1.275	1.147	...	...	24	28.860	+ 2.291
Wallasey Corporation	2.563	2.578	2.689	2.650	...	2.589	2.839	2.657	2.788	...	12½	33.326	+ 1.089
Wallasey Motor 'Buses	211	203	194	193	...	219	291	228	246	...	12½	2.950	+ 712
Walsall Corporation	1,620	1.685	1.704	1.706	...	1.566	1.592	1.618	1.591	..	13	20.323	– 1.600
Walsall Motor 'Buses	884	949	969	945	...	802	789	831	804	...	13	10.929	– 1.641
Walthamstow U.D. Council	2,065	2.308	2,198	1.996	...	2.194	2.019	2.393	2.340	...	12½	27.620	+ 1.710
Warrington Corporation	991	958	978	958	...	821	857	858	946	...	12	11 396	– 421
West Ham Corporation	5.295	5.265	5.259	5.251	...	5.184	5.417	5.745	5.780	...	12	68.885	+ 2.525
Wolverhampton Corporation ...	2.339	2.331	2.379	2.397	...	2.136	2.218	2.171	2.270	...	13	29.522	– 2.157
Wolverhampton Motor 'Buses ...	381	377	384	383	...	588	612	592	620	...	13	8.087	+ 3.063

Colonial and Foreign Tramway Traffic Returns.

Companies Issuing Weekly Returns.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	June 3	June 10	June 17	June 24		June 4	June 11	June 18	June 25		Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	74,755	78.960	76.217	78.361	...	81.776	79.776	75.607	74,858	...	25	2.007.111	+ 126.436
Calcutta ... ... Rs.	95,757	91.916	93.683	96,531	...	81,355	90.326	83.513	86,525	...	28	1,847.656	– 477.940
Madras... ... ... Rs.	...	(2 weeks)	42.236	...	...	...	(2 weeks)	47.759	...	...	24	394.057	– 133.809
Pernambuco	6,549	6,548	5,870	6,080	...	3,629	3,438	3,042	2,943	...	25½	100,663	– 88.129

Companies Issuing Monthly Statements only.

	1920.						1921.						Wks.	AGGREGATE.	
	Jan.	Feb.	Mar.	April	May	June	Jan.	Feb.	Mar.	April	May	June		1921.	+ or –.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	4,249	4,279	4,182	4,933	...	...	4,593	4,700	4,934	5,120	...	...	4	5.120	+ 187
Brazilian Trac. Mlrs	9655,000	9381,000	9900.000	10245000	10985000	...	12875000	11941000	13102000	13562000	14462000	...	22	55.942.00	+ 1577600
British Columbia	$ 828.709	746.030	761,182	749.081	720.004	...	368.202	792.590	816.452	791,688	774.523	...	47	3.753,164	+ 726.242
Buenos Ayres L'c'z.	52.643	52,468	55,000	53.429	54.563	50.635	61,111	53,952	59.365	60.238	58.492	51,071	52	680.516	+ 68.201
Burma	41,750	...	45,117	44,673	46.783	...	50,036	...	50,930	50,159	48.353	...	43	507.338	+ 58,142
Cape Town ...	...	...	...	...	24.395	...	...	...	...	27.662	27.407	...	—	—	—
Carthagena & H. ..	4,748	4,008	3,493	5,482	5,313	5,562	3,877	2,839	2,226	2,329	1,602	1,410	26	14,283	– 14,325
Cordoba	16,350	16,915	18.522	...	...	...	18,703	18.600	21,736	...	...	...	52	237,522	+ 36.887
East India ..	2,988	3,001	3,592	3,916	3,980	3,862	4,299	3,819	4,168	4,560	4,392	4,078	48	46,457	+ 11.046
Kalgoorlie	2,573	2,677	3.142	...	...	...	2,418	*316	2.485	...	...	...	13	5.219	– 3.173
La Plata	*3,145	5,892	6,392	6,142	...	...	6,506	*727	3,404	5,878	...	...	17	16.516	– 5.066
Lima	...	56,162	...	...	...	...	...	60.718	...	...	...	...	8	124,329	+ 9.593
Manilla ...	$ 278,451	278.437	263,690	254,103	261,803	...	321,450	306.389	298,317	279,535	293,873	...	22	1,499,564	+ 164,329
Monte Video ...	...	45.259	...	...	42.401	39,989	...	48,119	...	...	46.579	42,960	34	376,416	+ 29,128
Para	24,306	24,292	24,872	24,760	25,831	...	24,231	22,596	24,240	24,340	24,755	...	26	144,415	– 4.058
Port Elizabeth ...	...	...	...	...	6,165	...	...	...	...	7,082	6,304	...	—	—	—
Rangoon ... Rs.	112.000	115,000	130.470	117,860	119.000	...	122,558	120,718	158,121	125.163	138.950	...	22	665,540	+ 71,180
Toronto ...	$ 1130,486	1113,717	1255,668	1211,708	1206,930	...	1274,251	1228,722	1318,273	1259,933	1271,306	...	22	6.352,485	+ 433.976
Winnipeg ...	$ 498,837	444,873	456,915	431,685	404,742	...	506,229	460,125	495,208	462,378	433,836	...	22	2,357,776	+ 120,724

* Strike of employees.

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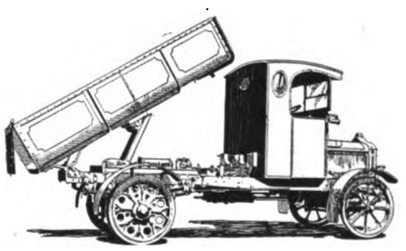
Daimler

RECENT DELIVERIES
of
DAIMLER 2-3-TON COMMERCIAL CHASSIS

ROBINSONS MOTORS LTD., SCARBOROUGH
CITY OF WESTMINSTER, HIGHWAYS DEPT.
FARGHERS GARAGE LTD., DOUGLAS, ISLE OF MAN
RICHMOND GARAGE, RICHMOND
WESTCLIFF-ON-SEA MOTOR CHAR-A-BANC CO.
W. CRAWFORD & SONS, BRIDGWATER
ASHTON-UNDER-LYNE CORPORATION
CLIFTON & KERSLEY COAL COMPANY
MANDENO SONS & HEWITSON, LIVERPOOL
G. FOWLER & CO., COWES, ISLE OF WIGHT
CROSVILLE MOTOR CO. LTD., CHESTER
DAVENPORT (C. B.) LTD., BIRMINGHAM
BUTTERLEY COMPANY LTD., DERBY
GLAMORGAN COUNTY ASYLUM, BRIDGEND
W. H. FURPHY, ESQ., LIVERPOOL
HEREFORD & MONMOUTH TRANSPORT CO. LTD.
PEEL CONNER TELEPHONE COMPANY LTD.
ONCHAN MOTORS LTD., DOUGLAS, ISLE OF MAN

The above deliveries are indicative of the adaptability of the Daimler Chassis to all trade purposes



The Daimler Company Limited
COVENTRY

LONDON OFFICE - - 27-28 PALL MALL S.W.I.

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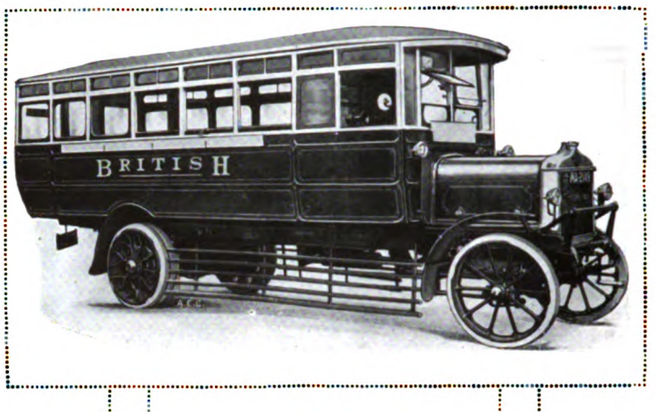

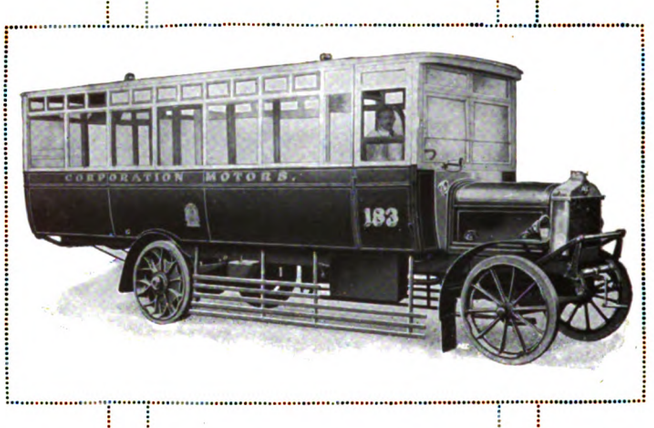

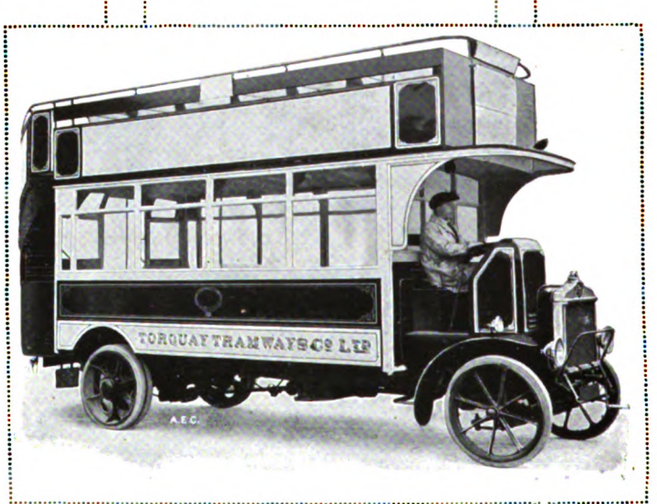

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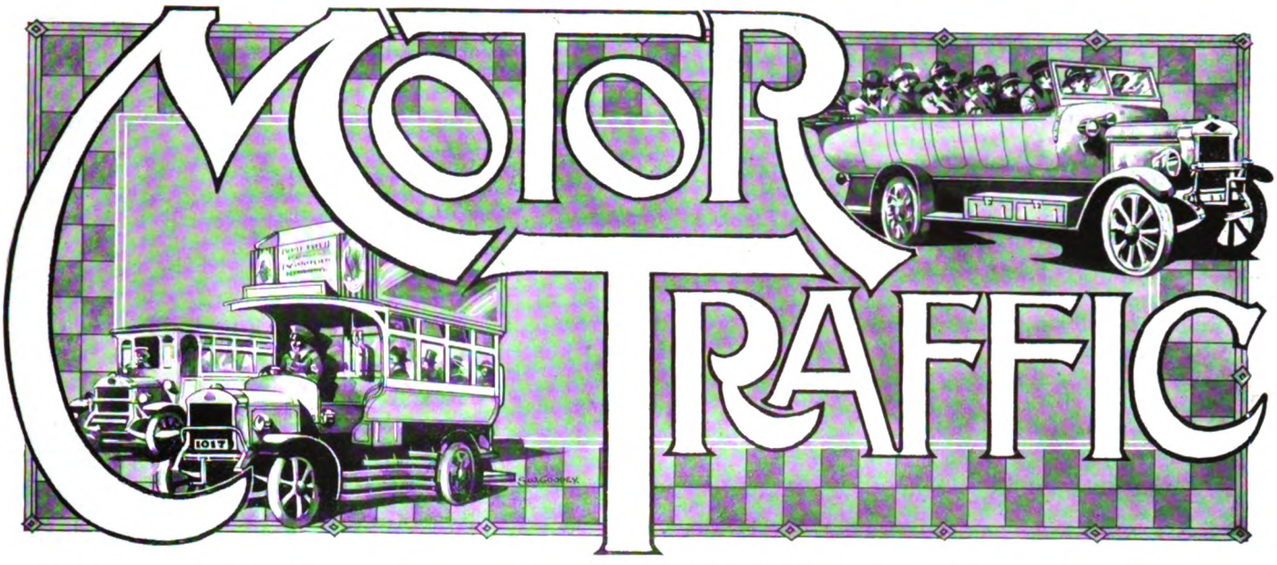

ON EFFICIENT WORKING.

In our last issue we referred to the supreme importance of ensuring that the future regulations as to speeds and weights of commercial motor vehicles shall be such as to increase the efficiency and economy of road transport. Costs have, of course, risen considerably during the last few years under such items as labour and fuel. The higher the cost of labour the more important is it that the output of the individual shall be increased. Assuming a definite limit to the duration of the day's work, we can only increase output by making the driver responsible for the performance of a larger number of ton miles of useful work. The ton mileage can be increased—

(1) By increasing the speed of the vehicle.
(2) By increasing the load carried at a given speed.
(3) By reducing or eliminating terminal and intermediate delays.

Our ability to benefit under the first two of these three headings depends upon the action of the Ministry of Transport. Our ability to benefit under the third heading depends upon our own organisation. So long as it can reasonably be said that we are not doing all we can for ourselves, any grievance we may have against the Government for not doing all it can for us loses much of its force.

Elimination of delays is partly a matter of the intelligent selection of vehicles. Intrinsically the larger unit is always the more economical. If we assume no terminal or intermediate delays, we may take it for granted that the 5-ton vehicle will carry goods at a lower cost per ton-mile than the 1-tonner. In practice, however, the theory does not always hold good. Suppose that we have a very large number of small parcels to be delivered over a round of twenty miles, and suppose that it takes on the average four minutes to deliver a parcel. This will mean that to deliver 120 parcels will take eight hours, leaving no margin for running time if an eight-hour day is assumed. Thus if the number of parcels to be delivered exceeds about a hundred it is hopeless to attempt to do the work with a single vehicle. To effect deliveries promptly, and thus give satisfaction to clients, we must therefore use a larger number of smaller vehicles, even though the method involves higher working costs.

It is evident that the working capacity of any vehicle used for delivery purposes can be increased if the average time occupied in making a delivery is decreased. Do we do everything possible to decrease these delivery delays to a minimum? Are our packages always so arranged that they can be picked out with the least possible trouble and delay? Do we insist on a system of payment which eliminates those delays that are inseparable from, for example, the system of payment on delivery? Payment on delivery is a convenience to customers, and is in the nature of an insurance against bad debts. It is, however, conceivable in many instances that its costs may more than balance its advantages. Suppose that with this system we can make, say, eighty deliveries in a day at a total cost of £2 a day for the operation of the van, the cost of each delivery is sixpence. If we can halve the time taken in effecting deliveries we can double the number of deliveries that can be effected on a given round in the course of the day, and this means that we are halving their cost. It is equally important to eliminate terminal delays. Every hour that a van is kept standing about for loading purposes during its working day means capital standing idle and wages being paid out to little or no useful purpose. It is very questionable whether we have yet sufficiently exploited the principle of interchangeable bodies, by means of which loading can go on steadily while the chassis with other loaded bodies upon them are engaged in useful work.

ECONOMY—FIRST AND LAST.

The most primitive conception possible in a business transaction is that of the buyer who focusses attention solely on the price of the article under consideration, but there is no doubt that this is the attitude adopted by a very large number of motor users. The transport department of a trading concern is in most instances not directly a profit-making branch of the business. Its object is to give service, and it is recognised that the buyers of the commodities which the trader offers will in many instances place their orders more on a basis of service than on a basis of cost. This attitude does not necessarily mean wilful extravagance. It is better to pay two shillings for something and get it when it is wanted, than to pay eighteenpence for it and get it after the need for it has past. The fact that service is worth money, and that the giving of good service enables higher prices to be realised, does not mean that a transport department can be inefficiently organised with impunity. What it does mean is that the service rendered by that department must be

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MOTOR TRAFFIC

punctual and dependable. The costs of running the department is far more a matter of operating costs than of the first cost of the plant employed.

Despite all these facts, one finds many people selecting motor vehicles almost entirely on a price basis, presumably on the assumption that variations in price in no way reflect variations in quality, and that once the vehicle has been purchased it will give the same service for the same length of time whatever it may have cost. To an extent the motor industry is responsible for this common fallacy. Although British engineering concerns base their reputation on quality rather than upon low price, they do not on the whole spend enough time and money in educating their possible clients in the art of buying to the best advantage. The price of the vehicle must, of course, be quoted, but it ought not to be emphasised to the exclusion of figures relating to the subsequent operating costs. Many traders spend less on their vehicles than on the petrol used in those vehicles' engines, and yet they will haggle over a few pounds in the first instance, but require no real substantiation of a maker's claims as regards petrol consumption. A saving of 20 per cent. in the first cost seems a big item because it is realised in one lump sum. An equal saving in petrol costs probably amounts to just as much in the long run, but is only obtained at the rate of a few pence each day, and so is apt to pass unnoticed. Again, we cannot cut price to a minimum and then expect to get a vehicle of exceptional durability and capable of working steadily with the minimum of repairs and breakdowns. In fact it does not always pay to buy in what appears to be the cheapest market, and neither does it necessarily pay to keep upon the road an old vehicle that has become extravagant in fuel and unreliable in service. In any properly kept statement of costs, the item of depreciation must figure, unless the vehicle is already so old that the whole of its cost has been written off. Suppose that a fair allowance for depreciation is threepence a mile, it may well be that a good modern vehicle will show a lower total of operating costs when this item is included than an obsolete vehicle will show when the item of depreciation is omitted altogether. When a vehicle grows old, the repair bill almost always shows an upward tendency. When this tendency becomes pronounced, so that it overbalances the higher depreciation allowance for a new machine, it is time that the old one was scrapped or sold to somebody whose financial limitations are such that he has no option but to buy something of the kind.

STANDARDISATION.

The more complete standardisation of parts is a matter of great importance alike to the user and to the manufacturer of motor vehicles. It is also a matter in respect of which we in this country cannot pride ourselves on having made exceptional progress. Undoubtedly we ought to be further forward than we are, but it appears that our somewhat backward position is largely due not to any lack of interest in the subject but to the fact that we have in the past organised the work along lines which have not proved particularly satisfactory. In aiming at standardisation, it is quite possible to fail through attempting too much, and it is apparent that the mere official approval of some design as a standard is not in itself effective, since manufacturers cannot be compelled to adopt it, and will not do so if its adoption would mean radical alterations coupled with great expense. Theoretically, in adopting standards we should aim at perfection regardless of current practice, but in fact this procedure would be abortive, and the only real hope of getting any standard widely adopted is to base it upon what is already common practice, and to aim merely at bringing the few exceptions into line rather than at revolutionising design as a whole.

Another weak spot in our old organisation was that it did not take sufficiently into account the fact that nothing can really be done without the support of the chassis manufacturer, who will ultimately decide whether he will incorporate the standards or not. So long as the governing bodies did not reflect the views of chassis manufacturers, their attempts to introduce standards were unsuccessful. The organisation has therefore now been reconstituted, and in its new form acknowledges, first, the principle that standards must be based upon general practice, and, secondly, the principle that British standards must be primarily determined by British motor manufacturers. The new committee for the standardisation of automobile parts, formed under the British Engineering Standards Association, is thoroughly representative of the motor manufacturing industry, though it quite properly includes also representatives of the principal using interests, the sub-committees, each dealing with some specific branch of the work, as, for example, small fittings, electrical fittings, steels, wheels, rims and tires, shafts and shaft details, and so on, are similarly formed. These sub-committees will in turn call in the help of locally constituted panels which will meet at places convenient to the chief manufacturing centres of the articles under consideration. These panels will suggest and prepare designs which will be revised or approved by the sub-committees, and will then be passed to the main committee for confirmation on behalf of the British Engineering Standards Association as a whole, after which they will become British standards, based upon existing British practice and therefore having a very fair chance of universal adoption, which is in the end the first essential to the success of the whole scheme.

HAMMERSMITH WORKS COMMITTEE have reported that the six electric vehicles are doing excellent work in the collection of house refuse. When the garage has been completed and charging apparatus installed, it is hoped that the wagons will prove of even greater utility.

REDUCTION IN PRICE OF PETROL.—The reduction of 6d. per gallon in the price of petrol, announced on May 28, has not satisfied users of the spirit, who consider the price still higher than is justified. It is argued that they are not receiving the full benefit of the large decrease in the price of crude oil, and that the reduction by 6d. was already due when the petrol tax of that sum was abolished.

NO EXEMPTION FOR MUNICIPAL VANS.—The Middlesex County Council have refused to exempt from licensing duty a motor delivery van in the service of the Health Department of the Willesden Urban District Council, contending that the van is chargeable at the horse-power rate of duty. The Health Committee of the Urban Council, in recommending the payment of £20 duty, do so without prejudice, and suggest that the Council should lodge an appeal.

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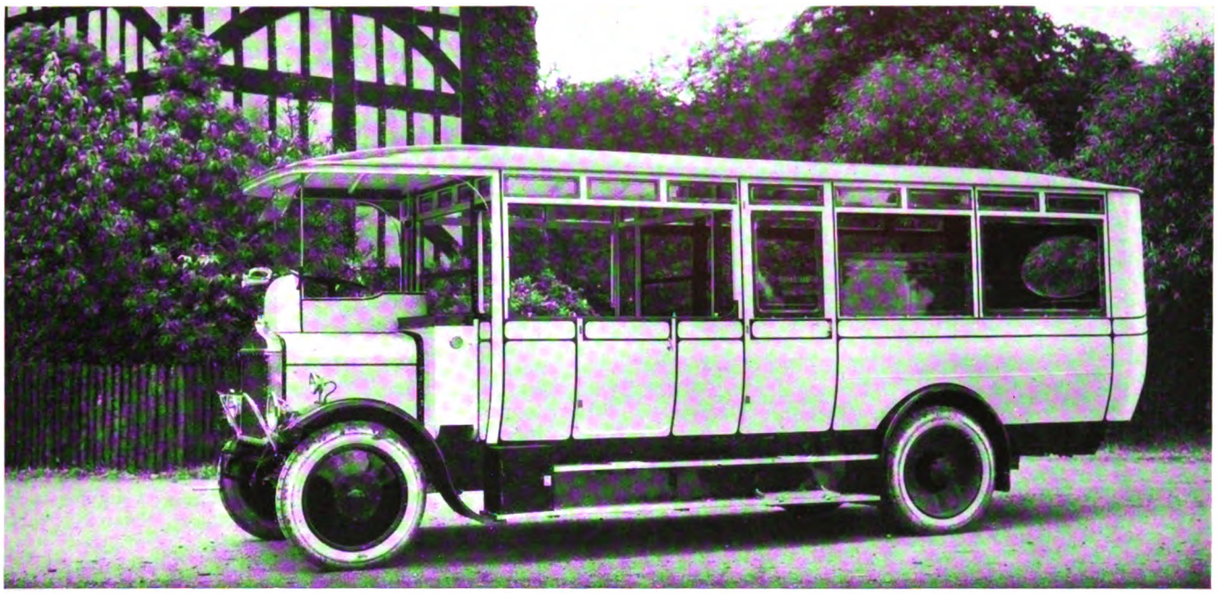
MOTOR TRAFFIC

NEW "ALL WEATHER" COACH.

DOUBLE SALOON A.E.C. VEHICLE.

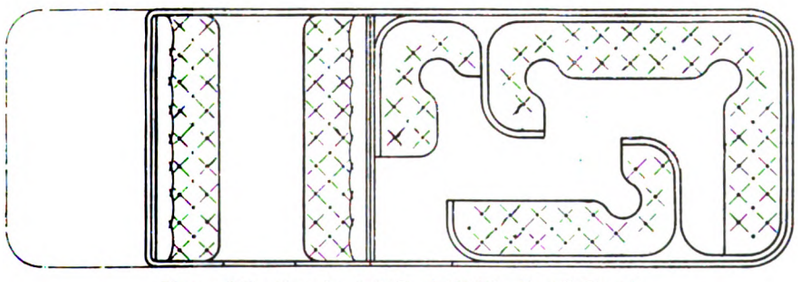
The accompanying illustration represents one of the latest developments in motor coaches—a new limousine "all-weather" coach with two saloons, manufactured by the Associated Equipment Company, of Walthamstow, London.

This vehicle is painted bright primrose, with black mouldings, and is upholstered in real antique leather. In the rear compartment all the windows drop, giving the coach the advantage of an open char-a-bancs. At the rear, a large oval window is fixed, affording a fine view.



Double Saloon A.E.C. "All Weather" Coach.

The front compartment has accommodation for ten passengers, or the seats can be removed and a large quantity of luggage carried. The total seating capacity is 28, and in the rear compartment the seating is arranged on the sociable plan. Dynamo electric lighting is provided throughout, with beautiful oxidised fittings, and the interior is of polished walnut, the ceiling being white enamelled Lincrusta. Michelin twin pneumatic tires are fitted, with a spare wheel at the rear. A speaking tube is provided between passengers and driver. The total weight of the vehicle is just under 4 tons fully equipped with petrol, water, tools, etc.



Plan of Seating in A.E.C. "All Weather" Coach.

The engine is of the "K" type and the dimensions of the vehicle are as follows—Length, 23 ft.; width, 7 ft. 4 in.; height, 8 ft. 8 in.; wheel base, 14 ft. 2¼ in.

The spot where the coach was photographed is Queen Elizabeth's Hunting Lodge, Chingford, Essex.

RUBBER FOR ROADS AND PLATFORMS.

On the occasion of the Rubber Exhibition at the Agricultural Hall, Mr. A. Harrison, borough engineer of Southwark, described his rubber road experiments carried out in association with Rubber Roadways, Ltd., a non-profit-making undertaking which has been established to develop the use of rubber. According to Mr. Harrison, rubber roads are not at present a commercial proposition, but the possibilities are worthy of attention. So far it had been demonstrated that the wearing capacity of rubber exceeded that of any other road surface. It has not proved slippery for horses, or conducive to skidding. The stretch of the Borough High Street paved with rubber was wearing splendidly. It comprised blocks of rubber vulcanised on expanded metal with "grips" to attach to the concrete foundation. As the cost of the experiment is being borne by Roadways, Ltd., Mr. Harrison could not go into the financial side, though he pointed out that the real cost of a road depended on its life. During the discussion Mr. Spurrell, the Holborn borough engineer, elicited that the cost was about £4 16s. a square yard, which was considered prohibitive. In this connection it is explained that in the early days of macadam, wood, and asphalte roads, the experimental roads were expensive.

Mr. Barker, who presided, said it was not the cost of rubber which affected the price so much as the cost of labour. Questioned as to the effect of drips of oil on rubber, Mr. Harrison stated that no harm had been done to the road. It was admitted that further developments were necessary to make rubber roads a practical proposal, the great need being a device to fix the rubber to the concrete to enable it to retain its position in heavy traffic roads. Meanwhile Mr. Harrison declares that he is well satisfied with the results.

Sir Ernest Birch remarked that noise and turmoil, which were experienced in all railway stations, could be avoided by the use of rubber flooring. If any company would undertake to cover its platforms at one of the great junctions like Willesden or Clapham Junction he would undertake to name a company that would provide the rubber free for the experiment.

BLACKPOOL.—The Borough Treasurer has been asked to report on the financial aspect of the Corporation establishing a municipal garage and the purchase of motor vehicles.

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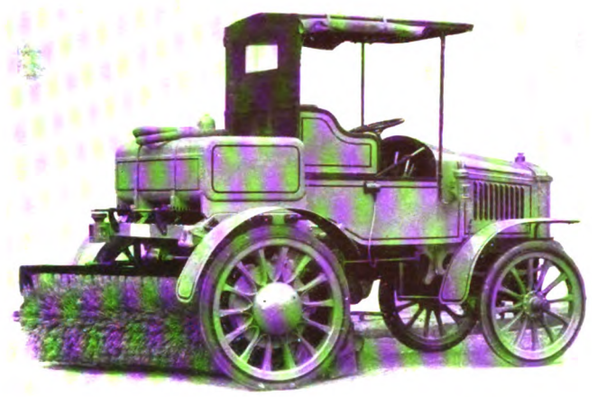
MOTOR TRAFFIC

LAFFLY MUNICIPAL MACHINES.

The two machines which are here illustrated, together with a number of other motor equipments, are now being sold in this country by the Laffly (England) Company, of 14 Addison Avenue, London, W.1. They are manufactured by Laffly and Company, Limited, of Billancourt, Seine, France, who for many years have made a special study of road sweeping, watering, and other municipal machines.

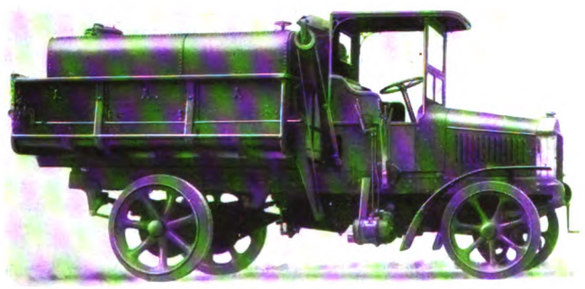
The motor street brush shown in the first illustration is fitted with a water spraying column which effectually prevents the rising



Laffly Road Sweeping Wagon.

of dust without leaving a coat of mud on the roadway, as is the case when the regular watering has been done previous to the sweeping operation. The machine is thoroughly well designed, for while of sturdy construction it weighs only 35 cwts., the fuel consumption being remarkably low. The pressure of the brush on the roadway is easily adjustable, while a new brush can be fixed to the car in 15 minutes. Owing to the perfect suspension of the brush, neat sweeping of the roadway is obtained, the throwing in and out of the brush being automatically controlled. The sweeping action of the machine covers a width of 5 ft. 11 in. and it runs at an average speed of 6½ miles per hour.

The 12-H.P. motor is of the four-cylinder type cast *en bloc* with forced feed lubrication and thermo-syphon water circulation. The



Laffly Convertible Hydraulic Tipping Wagon and Watering Machine.

change-speed gear is of the single-sliding type, giving three speeds and reverse, with an automatic device for throwing the brush in and out of action. The transmission is by means of suitable gearing. The back wheels are fitted with crown wheels in connection with pinions mounted on the two link shafts direct from the differential, fixed to the rear supporting axle. A geared pump supplies water under pressure from the tank to the spraying column, evenly watering the roadway over the entire length of the brush.

The machine shown in the second illustration is intended for use both as a tipping wagon and as a watering machine. It is so arranged that it can instantly be converted from the one to the other. The chassis, which is of strong girder formation, is fitted with a four-cylinder mono-bloc engine ($3\frac{1}{2}$ × $5\frac{7}{8}$), developing 24 H.P. at 1,200 revolutions. Forced feed lubrication is obtained through a gear-driven pump, the water circulation being maintained by means of a turbine pump, through a multitubular radiator. The change speed gear is of the single-sliding type, giving three speeds and reverse, controlled by an oscillating lever. The second motion shaft in the gear box carries a brake formed of a $11\frac{3}{8}$ in. diameter drum, the gripping surfaces being $2\frac{5}{8}$ in. with an arc of contact of 180 degrees. This is controlled by pedal gear, the wheel brakes being actuated through cams by means of the usual hand lever. The tipping cradle has a capacity of 106 cubic feet, and is formed of a wooden framing with removable upper rails so that there only remains the lower bottom part and the front separation when the vehicle is transformed into a watering wagon. The cradle is hinged to the back part of the chassis; the lifting device is situated in front of the cradle. It comprises a cylinder receiving a piston which slides into it under the action of oil under pressure contained in a tank placed above the lifting device. This piston actuates two pulleys fixed to its top end; on these pulleys run two cables, attached at one end to the chassis and at the other to two lugs fitted to the front of the cradle. The displacement of the fixed end of the cable is thus double that of the piston. The oil pressure is obtained through a gear pump actuated by means of a chain transmission, the driving pinion being fixed to the universal joint leading to the speed-gear box. The water tank, which has a capacity of 705 gallons, rests on the bottom of the cradle. It is secured at the front by means of an eye bolt engaging in the front end of cradle and at the back by a bolt passing through the bottom of the cradle. An opening provided in the front separation gives passage to a water outlet branch pipe. A flexible steel hose, fitted at both ends with an "express" union piece, connects the tank outlet pipe to the suction branch of the pump. The centrifugal pump is provided with two branches, a suction and discharge connection, and the turbine shaft, which is hollow to receive the rod connecting the engine clutch to the change gear, is fitted with a cone clutch, controlling its working. With an engine speed of 1,200 revolutions, a water pressure of 50 ft. is maintained and water is delivered at the rate of 175 gallons per minute. All the different controls are situated within easy reach of the driver, and much care has been taken to simplify the operation of the machine for whichever purpose it is being used. We understand that Messrs. Laffly will be pleased to arrange for demonstrations of either of these vehicles on request.

MODERN VIEW OF ROAD MAINTENANCE.

"The Maintenance of District Roads" was the subject of a paper read at the annual meeting of the West Riding Association of District Councils on June 7, by Mr. W. A. Stuart, divisional surveyor to the West Riding County Council. In speaking of the changed requirements necessitated by the extended use of mechanical transport, the author stated that of macadam surfaces, only those with a high standard of strength, and with a smooth and impervious face, could withstand the smashing effect of the heavy traffic, the tendency being towards the rapid formation of pot-holes and towards corrugation. The suitability of a road surface for present traffic requirements must largely depend upon (1) strength, (2) class of surfacing material, (3) drainage, (4) width of carriageway, (5) width between fences, and (6) alignment and grading. The spread of mechanical transport, its general adoption for commercial purposes, and particularly the extensive and increasing use of motor coaches, could not fail to make this form of traffic "the traffic of the district," and therefore the substantiation of a claim for damages under the head of "extraordinary traffic" would be increasingly difficult. Highway authorities should take a broad view of the question, recognising that mechanical road transport brought greater facilities for inter-communication, greater facilities for enjoyment, and was a great aid to commerce, and that substantial and efficient road maintenance was a matter affecting the propserity of the country.

On the question of road improvement, he said the first step should be the surface tarring of all good waterbound surfaces, on important district roads, irrespective of whether they were through a village or hamlet. Surface tarring should no longer be looked upon as a dust preventive. Its value as such was small compared with its value from a maintenance point of view.

Useful advice to the smaller local authorities was given during the discussion by one surveyor, who observed that they should have their own steam rollers for the repair of pot-holes, as it would prove profitable if used for only three months of the year.

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MOTOR TRAFFIC

EDISON ACCUMULATOR WAGONS FOR MUNICIPAL SERVICE.

During the past eighteen months Messrs. Electricars, Ltd., have been engaged in experimental and research work in connection with the needs of the municipal engineer and surveyor. One of the results of their energies in this direction is depicted in the accompanying illustration.

It is considered by the designers that this electric vehicle is the nearest approach that has yet been reached to the ideal municipal wagon. Two of the most important requirements of the refuse collecting wagon are—(1) Adequate carrying capacity, and (2) the keeping of the body sufficiently low to enable the filler to work without the use of a ladder.

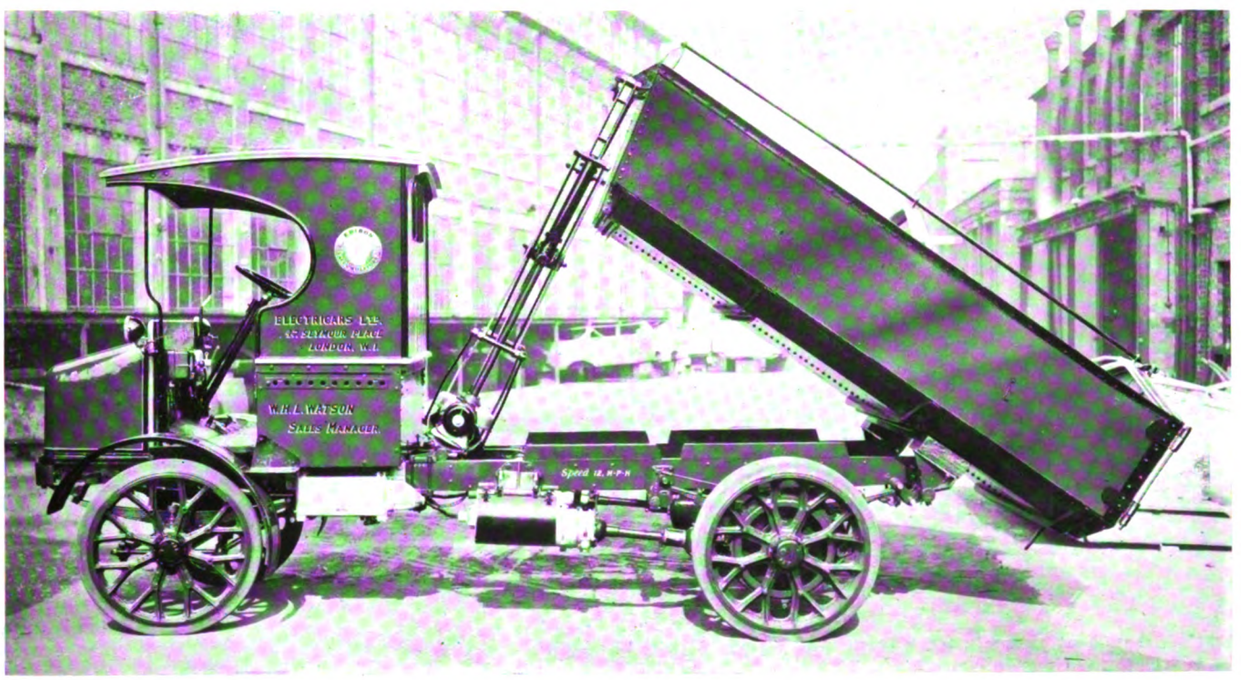
The first is a very difficult factor, owing to the different conditions which obtain in each town, but its importance is apparent when it is considered that no vehicle can be earning anything for the owner while it is standing idle being loaded. It is therefore essential to determine the correct carrying capacity of the vehicle in order to avoid wasting the time of the vehicle on the one hand and wasting the time of the fillers on the other.

all channel section bracing pieces are kept on the outside of the body, thus allowing the load a clean sweep when tipping.

The rear wheels are each driven independently through totally enclosed, continuously lubricated gearing from a series wound motor which is mounted outside the chassis frame, thus providing the greatest possible accessibility should the brush gear need adjustment. Indeed the two main features of this excellent example of British production are accessibility to all main components and simplicity of design.

As an example it may be mentioned that in addition to the motors being mounted outside the chassis frame, the controller box is also mounted outside the frame on the near side immediately behind the front mudguard. From time to time the Edison battery requires a little attention in the form of "topping up" with distilled water, and with this in view the battery compartments on the model "E.A." chassis are situated under the driver's seat and under the bonnet in front of the dash respectively. It will therefore be seen that the facility for ease of operation and maintenance is a feature that has received most careful consideration.

The body, which is entirely constructed of sheet steel, is tipped by an automatic electric tipping gear. This is put into action by a simple reversing switch. As soon as the switch is closed a small electric motor raises the front end of the body by means of a square threaded screw (through a suitable reduction gear) and a nut of ample proportion, to which is anchored a series of toggle jointed levers which have a scissor-like action. The process of tipping is effected within thirty seconds.



Municipal Tipping Wagon by Electricars Ltd.

In practice it has been generally found that the 40 to 50 cwt. Edison accumulator wagon has been the most economical unit to employ for this class of work.

With regard to the second point, it is almost unnecessary to say that while the old method of using a ladder to load the van with the horse-drawn vehicles was tolerated, it is absolutely ruled out in the case of mechanically-propelled vehicles, owing to the enormous waste of time involved.

In the case of the wagon under consideration, it would certainly appear that Messrs. Electricars, Ltd., have been successful in keeping the loading line sufficiently low, as in this instance it is only five feet from the ground, which means loading from the kerb at a height of four feet eight inches.

The chassis is an improved type of the model originally produced by Messrs. Edison Accumulators, Ltd., who were the pioneers of the electric vehicle industry in this country. It is known as the Model "E.A.," and has proved to be very satisfactory in a large number of towns and cities.

The chassis frame is of the built-up type, the side members being constructed of two high tensile steel flitch plates reinforced by well-seasoned American ash filler pieces, while solid drawn steel tube provides for the cross members. It is interesting to note that

We understand that at present this type of vehicle is being manufactured in two sizes, which have a carrying capacity of 50 and 70 cwt. respectively, and that in each case the guaranteed life of the battery is for 60,000 miles.

INSTITUTE OF TRANSPORT AND THE PRESS.—The *Journal of the Institute of Transport* states that certain papers submitted to the Council have been disqualified because they had been published in the Press. It should therefore be borne in mind that papers submitted for consideration, whether accepted or declined, become the property of the Institute, and the Council may publish them in any way or at any time.

STATE AID FOR MOTOR LORRY.—The Ministry of Transport have promised East Ham Corporation a grant of £294 towards the estimated cost of £881 for the purchase of a Burford tipping lorry for use in the improvement of roads.

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MOTOR TRAFFIC

BARFORD MOTOR ROLLERS.

The accompanying illustration shows a fleet of motor rollers made up of a selection from the various standard ranges which Barford and Perkins, Limited, are manufacturing for the use of county and municipal authorities, road contractors, and others. The fleet consists of 20 machines and includes a wide range of rollers from 14 tons down to quite small models. The photograph was taken in Peterborough, adjacent to the company's works.

Barford and Perkins were the pioneers of the motor roller and from its introduction seventeen years ago it has become increasingly popular, the use of paraffin as fuel facilitating its adoption for even the heaviest class of work. The range of standard sizes are fifteen in number, but in addition to these the firm also make a variety of rollers for special purposes. The tandem pattern roller has been made the standard on account of its even distribution of weight; this is a most important feature in connection with tar macadam and roads with poor foundations. The principle of water ballast in the Barford rollers is also of importance, as it allows of considerable variation in weight according to the nature of the work to be done, while the possibility of lightening the roller to pass over weak bridges in many cases permits the use of a heavier roller than would otherwise be possible. The saving in freight for export is also an item of importance.

All the motor rollers are fitted with an engine of massive construction, governed to run at a moderate speed, the lubrication being automatic. Two-speeds gearing, both forward and reverse, is fitted, a gradient of one in seven being easily taken on the low gear. The form of paraffin vapouriser used has been adopted after exhaustive experiments. It has proved a thorough success, so that all rollers can be fitted to use either paraffin or petrol, as required.

For County Council work the "J" type has been found the most suitable, for while being sufficiently heavy for foundation work when fully loaded, it is light enough for tar macadam when unballasted. The full weight of this machine is 12 tons—10 tons when empty. It is fitted with a four-cylinder engine, developing 30 to 40 B.H.P., and fuel tanks carrying a full week's supply.

A Selection of Barford and Perkins' Motor Rollers.

WAGES OF ROAD TRANSPORT MEN.

A national agreement regarding the wages of commercial road transport workers was signed on June 29 by the National Transport Workers' Federation. In the mechanical section the rate is 79s. per week, taken in conjunction with a cost of living index figure of 125 points. The rates are to remain in operation until the first full pay week in November, all other conditions to remain as at present. At a conference of the Lancashire Federation of Road Transport Associations and representatives of the United Vehicle Workers' Union and the United Road Transport Workers' Association it was agreed to reduce by 3s. a week from the week ending July 9 the wages of all Lancashire Federation transport workers in Accrington, Blackburn, Darwen, Bolton, Burnley, Preston, Chorley, Padiham, the Rossendale Valley, and Haslingden.

MUNICIPAL MOTOR VEHICLES.

Demonstration in Lincoln's Inn Fields.

In connection with the annual meeting of members of the Institution of Municipal and County Engineers in London, a demonstration of mechanically-propelled vehicles used in municipal work was held in Lincoln's Inn Fields, Holborn on Thursday, June 16. The arrangements were made by Mr. E. F. Spurrell, borough engineer, Holborn (hon. secretary for the Metropolitan District of the Institution), and a most comprehensive display of machines, covering all branches of municipal work, was made. In all twenty-four exhibitors took part in the demonstration, many of these showing two or more vehicles. All types were represented—steam, electric, petrol, and petrol-electric, embracing fire-fighting appliances, road rollers, tipping wagons of a wide variety, street sweeping machines, gulley cleansing wagons, street washing machines, refuse collecting vans, road gritting machines, and motor ambulances, together with trailers of various kinds, tar boilers, concrete mixers, etc. The attendance of members was exceptionally good, and keen interest was taken in the practical demonstrations which were given by a number of machines, each working under ordinary service conditions. A considerable number of the vehicles were exhibited by the Metropolitan Borough Councils.

The Exhibits.

Among the exhibits were several by Agricultural and General Engineers, Ltd., who showed their "Aveling and Porter" 10-ton steam roller, with patent water-spraying apparatus; their "Barford and Perkins" 11-14 ton motor roller; "Garrett" 5-ton steam wagon, and 2½-ton electric vehicle, with electrically operated end-tipping body. Karrier Motors, Ltd., had their road sweeping and collecting machine, with a capacity of 5 tons. Millars' Timber and Trading Company exhibited their gasoline Tructractor, of 27 cubic feet capacity, and a Buffalo-Springfield tandem steam roller, while their Jaeger portable concrete mixer was demonstrated by the Holborn Borough Council. This authority also displayed their Straker-Squire street washing machine, with a tank capacity of 1,100 gallons; a vacuum gulley cleanser by the same makers, with a cylinder of 850 gallons capacity, and a Lacre motor sweeper. The Lacre Motor Car Company were further represented by their tipping wagon and gulley emptier. Carrosserie Latymer, Ltd., showed their 4-ton side and end tipping trailer. Tilling-Stevens Motors, Ltd., displayed their well-known petrol-electric end-tipping vehicle. Tuke and Bell sent two road gritting machines, a 1-ton end-tipping motor vehicle, and an either-side tipping trailer. A 40-H.P. Thornycroft motor wagon, with twin screw tipping body, belonging to Westminster City Council, was on view; Hackney Borough Council showed electric dust vans supplied by Ransomes, Sims and Jefferies, and the Hendon Council were represented by a Clayton steam wagon. The Laffly (England) Company sent a watering machine, convertible into a 4-ton hydraulic tipping wagon, and a 7-ton dust tipping wagon, while their four-wheeled motor sweeper was shown by Shoreditch Borough Council. A street washing wagon, with high pressure discharge, was the contribution of Atkinson and Co., of Preston.

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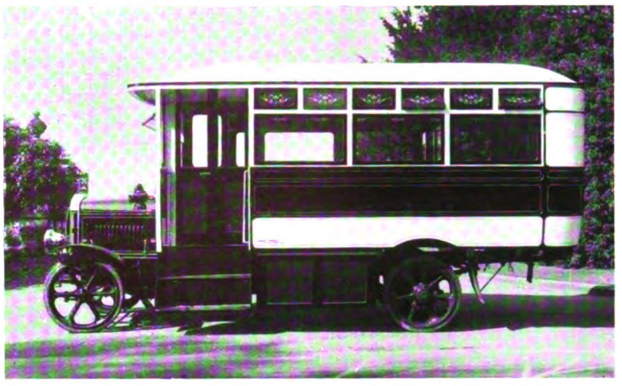
MOTOR TRAFFIC

NEW TILLING STEVENS OMNIBUS.

The accompanying photographs are of a new single-deck, front entrance type omnibus which Tilling-Stevens Motors, Ltd., of Maidstone, are supplying to Blackpool Corporation. The body is mounted on a Tilling-Stevens 25-30 H.P. petrol-electric chassis, though in the case of this particular vehicle the steering column is placed outside the main off-side frame member, instead of inside. This arrangement, by allowing more room at the entrance, facilitates the entry and exit of passengers. The wheelbase is 12 ft., and the maximum length of the frame behind the dashboard is 14 ft. 4 in.

New Single-Deck Omnibus for Blackpool.



Blackpool Omnibus Showing Front Entrance.

The maximum gross loaded weight will be about 5 tons 9 cwt. The frame is of pressed steel throughout, strongly braced by cross members which have large gussets formed solid with them. A sub-frame, attached to the main frame by means of a three-point suspension, supports the engine, and two longitudinal sub-members carry the dynamo and motor. Each of the main side members is pressed from one solid steel plate. The road wheels are of cast-steel, the rear pair having twin tires.

The interior, which accommodates 20 passengers, is varnished in natural grain. The seats, upholstered in "Rattan," are extremely comfortable.

THROUGH THE HOME COUNTIES.

L.G.O.C. Day Coach Tours.

Those Londoners and visitors to London who are not fully aware of the charming nature of the country which lies within 30 to 40 miles of Charing Cross have an excellent means of enlightening themselves in the series of motor coach day tours organised by the London General Omnibus Company. There are six different routes, running out in practically every direction, to choose from; all are full of interest, and introduce the passenger to stately and alluring scenery. The Home Counties, in addition to their rustic fascination, also contain many historic landmarks and famous old residences, all of which are pointed out, and their literary associations recalled, by a guide who accompanies each vehicle. A party of London pressmen who made the Wendover trip on a beautiful day at the invitation of the L.G.O.C. were much impressed with the first-class arrangements of these tours. They commence from the company's offices at 31 Broadway, Westminster, at 9.30 or 10 a.m. Luncheon and tea are served at some well-chosen hotel or restaurant in two of the principal places of interest *en route*, and the return journey—made by a detour—is completed in the early evening.

The trip to Wendover was full of most varied interest, but above all left a happy impression of the wooded slopes of the Chilterns, glimpses of fine estates, of the wonderful Burnham Beeches, and of quiet Stokes Poges, immortalised in Gray's Elegy. At Wendover luncheon was excellently served at the historic Red Lion Hotel, and in welcoming the guests on behalf of the L.G.O.C. management, Mr. S. J. Webb mentioned that the present series of six different trips is a development from half that number which were run last summer. Tea was served at Burnham Beeches, and the concluding stage of the journey was made through Isleworth and Richmond. Mr. J. H. Richardson, who is in charge of the company's press bureau, and his assistant, Mr. B. C. Foxcroft, accompanied the party.

Very comfortable 27-seater coaches are used on these tours, and in order to make the outings as select as possible, only one vehicle is used on each route. The other tours are to Guildford and Hindhead; Maidstone and Rochester; Tunbridge Wells; St. Albans and Hatfield; Windsor and Burnham. The inclusive charge is a guinea per head.

Leaving London for Wendover.

Passing Chequers Court.

Guide Indicating Points of Interest.

For Tourists to Aberdeen.—The Corporation Tramways Committee have decided to issue a tourists' map of the city, giving tramway and omnibus routes, tours, etc.

Coach Trips from Dundee.—Motor coach pleasure trips have been inaugurated by the Tramways Department of Dundee Corporation.

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MOTOR TRAFFIC

MOTOR TAXATION.

850,000 LICENCES ISSUED.

The Ministry of Transport have issued a statement showing approximate figures of the number of motor, etc., licences issued from January 1 to May 31, 1921, and of the tax collected during that period. These figures include both annual licences and also licences in respect of the first and second quarters. The number of motor vehicles for which licences were in force on May 31 was approximately 853,900. As compared with the previous return the most marked increase is in category "motor hackneys," where the annual licences have increased from 40,500 to 64,000, while the second quarter licences were 32,500 as compared with 1,200 in the first quarter. The "horse-power" class, which includes all private cars, shows an addition of 2,000 annual licences, while the quarterly licences have increased from 14,000 to 36,000. The increase in the number of licences for goods' vehicles is relatively small, and it is possible that the numbers shown for this class in the previous return were slightly over-estimated. The rebate of 25 per cent. allowed in the case of "horse-power" vehicles whose engines were constructed before January 1, 1913, has been paid in approximately 31,300 cases, the amount refunded being £133,700. The total of £8,750,000 has been collected as follows—England and Wales, £7,922,650; Scotland, £811,250; Ireland, £16,100. (It was not found possible to commence the collection of the new taxes in Ireland until towards the end of the period under review.)

The following is an extract from the approximate analysis of the motor tax receipts from January 1 to May 31, 1921—

Type of Vehicle.	Approx. No. of Licences Current, May 31.	Approximate Tax Receipts.
		£
Cars taxed on h.p. ...	226,000	3,570,000
Commercial goods	120,000	2,400,000
Road locomotives etc. ...	2,900	58,000
Motor tractors etc. ...	1,400	19,000
Motor hackneys	96,500	1,530,000
Tramcars	15,200	11,400

The Ministry of Transport hope to issue statements similar to the present one as soon as possible after the end of February, May, August, and November in each year.

PROSPECT OF REDUCTION OF DUTY.

In reply to representations from the Motor Legislation Committee, urging a reversion to the system of petrol duty instead of the present method of taxation by horse-power, the Minister of Transport has stated that experience of the present system is not sufficiently long to enable him to arrive at a definite opinion, but if the present scale of taxation produces revenue in excess of that budgeted for, the Ministry of Transport have hopes of recommending a decrease. The Ministry have also been asked to grant quarterly licences, to be issued at any date, at charges proportionate to the yearly licence.

INSTITUTION OF AUTOMOBILE ENGINEERS.

SUMMER VISIT TO LONDON.

The 1921 summer visit of the Institution of Automobile Engineers was a marked success, in spite of the late alteration in the venue. The original idea was to visit Birmingham, but the state of trade throughout the country made it evident that the majority of the works could not extend to visitors such a welcome as they would have liked, and it was decided to make London the headquarters.

On Tuesday, June 14, the Associated Equipment Company kindly placed a "K" type omnibus at the disposal of the party to visit the Royal Aircraft Establishment at Farnborough, and a speedy and pleasant journey was made. It was considered remarkable that a vehicle designed for use on London streets should form such an efficient and comfortable means of transport over the Hog's Back, which was the road taken on the return journey. Various new and ingenious aeronautical devices were inspected at the Royal Aircraft Establishment.

After lunch the party journeyed to the R.A.S.C. Headquarters at Aldershot, where General Sir Evan Carter and Commandant Brooke had prepared an interesting programme of inspection of captured German transport vehicles. The officers of the R.A.S.C. who conducted the party round made this a very instructive visit. After the inspection an interesting display of manœuvring over rough ground was given by a wheel tractor and a caterpillar tractor; the latter proved its superiority in mounting very steep banks. After entertaining the members to tea, Sir Evan Carter, in a kindly speech, emphasised the necessity for the closest co-operation between the military and the civil side of motor transport.

On Wednesday the party proceeded by launch to Hampton Court, and in the afternoon a visit was paid to the National Physical Laboratory, which proved of the greatest interest.

On Thursday, June 16, members were introduced to what was a novelty to probably all of them, and by the kindness of the Port of London Authority a visit was paid to the warehouses in the London Docks, where the arrangements made for the storage of wine, ivory, wool, spices, etc., were explained. After lunch an interesting two hours were spent in the laboratories of the G.P.O. where all the instruments used in the testing of telephone circuits, and apparatus, wireless plant, and other devices were demonstrated in actual operation. The trip was brought to a fitting conclusion by a visit to the Mansion House, where the Lord Mayor received the members and himself showed them some of the treasures and entertained them at tea.

OMNIBUS SERVICES.

CHESTERFIELD.—The Corporation omnibuses made a profit for the year of about £4,000.

WALSALL.—The annual accounts show a loss on the motor omnibus undertaking of nearly £10,000.

GREAT YARMOUTH.—There was a loss of £230 on the omnibuses of the Corporation Tramways for the past financial year.

BLACKPOOL.—Two Tilling-Stevens single-deck omnibuses are being used on the new service which the Corporation have instituted between Cleveleys Beach and Thornton Railway Station

LINCOLN.—The Tramways Committee recommended that their omnibuses should be let out for hire on Sundays outside the city, but the proposal was not carried. The voting was equal, and the Mayor did not give a casting vote.

NORTH-EAST CHESHIRE.—Omnibus services have been instituted between Cheadle, Gatley, Baguley, and Altrincham, and Cheadle Hulme is to be linked up with neighbouring places, with connections for Stockport. Other new services will be between Heaton Mersey and Stockport.

ABERDEEN.—The summer evening traffic to the beach has been so great that a two-and-a-half-minute tramway service, augmented by the Corporation omnibuses, has not been able to meet the requirements. On a number of occasions privately-owned coaches have entered into competition with the municipal vehicles.

GLASGOW.—At a meeting of the Corporation on June 22, the convener of the Tramways Committee (Bailie M'Whirr), in reply to a question, undertook to bring before the committee the advisability of the Corporation obtaining powers to construct and equip in the city a station, or stations, for motor coaches, and to acquire and run a fleet to Loch Lomond Park and other districts.

LIVERPOOL.—When the Corporation Bill came before the local Legislation Committee of the House of Commons, the Ministry of Transport asked that the powers sought in respect of omnibuses should be clearly defined. Mr. Thomas, K.C., for the Corporation, said there was no doubt that the powers were limited to operation within a radius of 12 miles from the old city boundary, and the clause was agreed to.

LONDON AND BRIGHTON MOTOR SERVICE.—A fast morning and evening service of motor coaches between London and Brighton is being arranged. The coaches will pick up passengers at their doors and convey them to their destination. Taking into consideration the time spent in going to and returning from railway stations, it is thought that the entire journey by motor coach may not take any longer time than the journey by railway. It is proposed to issue season tickets.

EDINBURGH.—The City Corporation are faced with the problem of providing suitable road surfaces for omnibus traffic. A committee recently reported upon the effect of the traffic, pointing out that drivers had adopted the practice—sheep fashion—of following in the same wheel track on every journey. The result is that on both causewayed and macadamised thoroughfares ridges are formed, which are dangerous to other traffic, since in some cases the ridges are equal to pavement kerbs.

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MOTOR TRAFFIC

MOTOR VEHICLES FOR MUNICIPALITIES.

ANDOVER.—The Town Council are contemplating the purchase of a fire engine.

ILKESTON CORPORATION have decided to purchase a Martin-Walter first-aid motor fire engine at £465.

HULL.—The Tramways Committee have resolved to purchase two new omnibuses for the Stoneferry service at a cost of £1,850 each.

SHEFFIELD WATCH COMMITTEE intend to purchase a motor fire pump, with accessories, from Leyland Motors, Ltd., for £2,085.

WILTS COUNTY COUNCIL have decided to purchase three 3-ton Hallford motor lorries at £1,175 each, and twelve 1-ton Ford lorries at £312 each.

CALCUTTA MUNICIPAL COUNCIL has decided to purchase a Thornycroft "Q" type lorry at 18,500 rupees, and a Mack (American) lorry at 16,000 rupees.

GOSPORT AND ALVERSTOKE COUNCIL have taken delivery of a motor fire engine supplied by Dennis Brothers, of Guildford. At a trial it gave complete satisfaction.

BOURNEMOUTH CORPORATION WORKS COMMITTEE, who have been considering the question of mechanical traction, have recommended the purchase of three cars at a cost total of £1,050.

EAST HAM WORKS COMMITTEE have considered tenders for three electric vehicles, and recommend acceptance of that submitted by the Agriculture and General Engineers (Garrett), Ltd., amounting to £1,200 per van. The vehicles are required for refuse collection.

DURBAN (SOUTH AFRICA).—The Corporation are securing eight electric vehicles, and have arranged to place the fleet in charge of the electrical engineer, who has had considerable experience in the charging, maintenance, and equipment of electric vehicles. The Corporation electricity department is already partly equipped with charging plant, but a new garage for all the vehicles will be erected when the new wagons are delivered.

BIRMINGHAM.—The Corporation Cleansing Committee report the purchase of two additional Foden steam wagons at £1,305 each. The Salvage Committee report that in the near future considerable additions will have to be made to the fleet of electric vehicles. Since electric dust vans were introduced, it had been possible to adopt the "continuous" system of collection, which had proved both efficient and economical. The Corporation now has about thirty electric vehicles.

YORK COUNCIL have decided to purchase a 4-ton petrol wagon. According to a report presented by the city engineer, the sum of 22s. a day is paid for the hire of a horse and cart, whereas their own horse transport did not cost anything like that amount. The present steam wagon cost 15 per cent. more than a petrol wagon. It took a steam wagon 25 hours to deliver 10 loads, whereas it took a petrol wagon 20 hours. The committee also recommended that the present steam wagon be retained for any work which might arise.

GLOUCESTER CITY SURVEYOR, at a conference of the Royal Sanitary Institute held at Gloucester, read a paper on the collection and disposal of town refuse. He remarked that when all roads were made waterproof, mechanically-driven sweeping machines, probably with a vacuum action, would make it possible for the streets to be cleansed every day. He advocated electrically-propelled vehicles for the collection of house refuse, and he added that destruction by fire was the best method. The average cost of this method was about 18s. a ton in Gloucester.

REGULATING MOTOR COACH TRAFFIC.—The Motor Car Committee of the Southampton County Council recall that some months ago they recommended application to the Ministry of Transport for an order prohibiting the driving of motor coaches on various roads in the Christchurch, Fordingbridge, and New Forest rural districts. At the suggestion of the Council the committee have since reconsidered the matter, and have been in communication with the District Councils which had applied for the closure of the roads to such traffic. In the case of Fordingbridge and Christchurch, where the lengths of roads was considerable, the District Councils have decided to modify their applications. Before making any definite recommendations, the Motor Car Committee now suggest that the most satisfactory course, and one that will probably save trouble in the end, will be for them to arrange a conference with the local representatives of the Motor Traders' Association.

MOTOR TRAFFIC NOTES.

RENT FOR PETROL PUMPS.—Kendal Town Council have passed plans for the erection of two petrol pumps on the pavement, subject to an annual rent of 10s. 6d., and the illumination of the pumps at night.

FUEL ALCOHOL IN FRANCE.—The French Government is in possession of huge stocks of alcohol and benzole, and efforts are being made to put fuel alcohol on the market, especially for use with lorries and taxicabs.

LONDON'S S TYPE OMNIBUSES.—The London General Omnibus Company have announced that within the next two months the number of S type (54 seater) omnibuses, which were described in our issues of December 10, 1920, and January 13, 1921, will be increased to 250.

GRAVESEND-TILBURY TUNNEL SCHEME.—The Town Clerk of Gravesend is circularising local authorities for support to the scheme for a Gravesend-Tilbury tunnel to afford communication between the Midlands and the North and Southern counties for both rail and vehicular traffic.

LONDON TO EDINBURGH BY COACH.—Arrangements have been made for running coaches from London and intervening towns to Edinburgh for the meeting of the British Association in September, at fares approximately two-thirds of the railway charge. From London the journey will occupy two days, and hotel accommodation will be provided.

BAN ON MOTOR COACH TRAFFIC.—Writing to some of the local Councils, the Somerset County Council intimate that they have passed the necessary resolutions for orders closing several roads in the county to motor coach traffic, but that the matter had been delayed pending the issue of certain regulations by the Minister of Transport.

AUTOMOBILE STANDARDISATION.—The Automobile Sub-committees of the British Engineering Standards Association are already making a start at actual standardisation work. Certain proposals for standardisation in connection with small fittings, which were put forward some time ago by the Association of British Motor Manufacturers, were considered at a meeting of Sub-committee 3 on June 30.

DANGEROUS REFUGES.—Owing to recommendations of coroners' juries, refuges have been erected in Old Kent Road near Marlborough Road, but the Ministry of Transport are now calling for their removal. The Ministry points out that numerous accidents have occurred since the refuges were erected, indicating that the position is unsuitable, and that the refuges are a source of danger. The Commissioner of Police concurs in this view.

DEVELOPING THE MOTOR COACH.—Bridlington Corporation have appointed delegates to the local Business Men's Association to attend a conference with motor coach proprietors in Leeds and Sheffield in order to ascertain the possibilities of inaugurating a regular service of coaches between Leeds, Sheffield, and Bridlington. The Bridlington Corporation are also endeavouring to make arrangements at High Green for the parking of motor coaches.

EXEMPTION FOR MUNICIPAL MOTORS.—The Metropolitan Boroughs Standing Joint Committee report that they are making representations to the Ministry of Transport and the Chancellor of the Exchequer as to the desirability that all motor vehicles used by local authorities for public services should be exempt from licensing duty, in a similar manner to fire engines, ambulances, and steam rollers. A conference of local authorities is being called by the Holborn Borough Council for a similar purpose.

ROAD TRANSPORT AND RAILWAYS.—An official of the Railway Executive has stated, according to the *Daily Mail*, that a resolution moved at a meeting of the Association of British Chambers of Commerce against the railways engaging in road transport was not carried. An amendment proposed by Manchester and seconded by Huddersfield was carried to the effect that "The railway companies should have the right to carry goods by road provided always that adequate safeguards are established by competent authorities for the protection of other road haulers and traders."

AN IMPORT DUTY POINT.—Camberwell Board of Guardians have been in correspondence with the Commissioners of Excise and Customs with reference to the repayment of import duty amounting to £23 in respect of their Ford van. The claim was refused, as the van had not been used solely for carrying goods, but on special

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MOTOR TRAFFIC

occasions for the conveyance of inmates. Now, however, the Commissioners have intimated that on the Guardians undertaking that the vehicle will be used exclusively for the conveyance of goods they will repay the import duty. The Guardians have given this undertaking.

Test Case in Lorry Taxation.—The Ministry of Transport are appealing against the decision of the Downham Market magistrates on the test case as to whether a motor lorry used in agriculture is a vehicle used for the conveyance of goods in the ordinary course of trade—in other words, whether it should carry a tax of £6 or £30. The Bench decided that the vehicle came within the description of a tractor used for haulage solely in connection with agriculture and that the tax should be £6. The Farmers' Union fought the case for the farmer, and, it is understood, will defend him in any further action which may be taken.

A Coroner on Reckless Driving.—At an inquest held at St. Helens on June 13, when a verdict of "Death from misdaventure" was returned in the case of an old man run over by a motor lorry, the coroner said he had felt for a long time that there was a great deal of reckless driving by motor drivers. He was continually watching heavy traffic going through Burscough Street, Ormskirk, at twelve, fourteen, and twenty miles an hour, and there was scarcely room for anybody to get on the footpath. Drivers were boxed up in front of the lorry, and when a trailer was attached anything might happen, and no one on the lorry would know anything about it.

Interesting Action at Perth.—Developments in the motor coach action against the Perth Corporation are of much importance to the trade. Valentine's Chars-a-bancs, Ltd., Perth, sought to interdict the Corporation from running its motor omnibus service beyond a three-mile radius of the tramway termini, but the Sheriff Substitute refused an interim interdict. Sheriff Principal Sandeman has recalled that decision, and granted an interim interdict. His Lordship states it is clear that the Corporation has been acting in excess of its powers. In his opinion it was the duty of judges to apply the law, and not to give effect to their ideas of general public convenience.

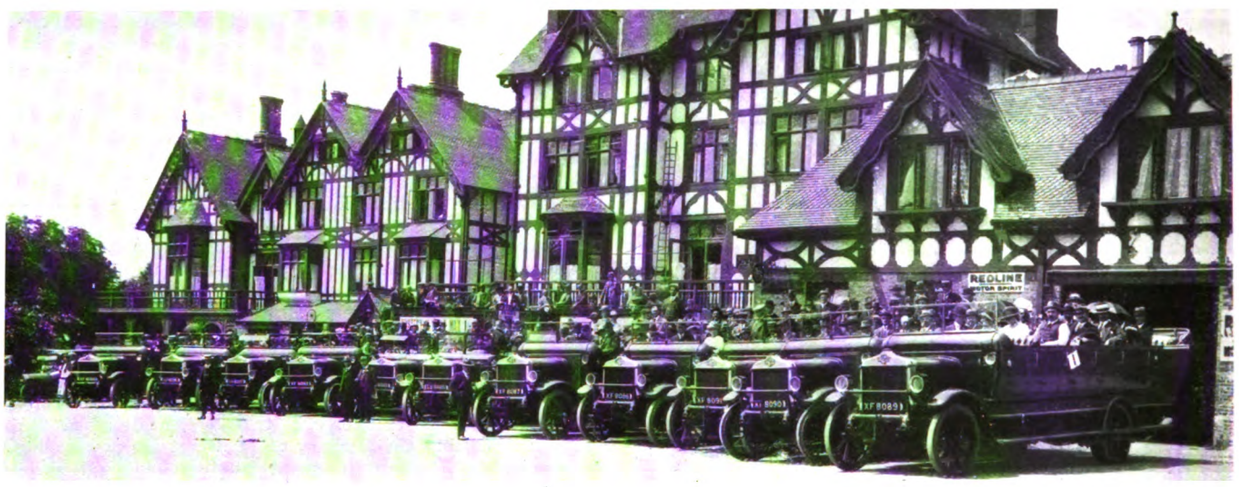
Lord Mayor of Leeds and Coach Traffic.—Responding to the toast of his health at a dinner of the National Council of the Commercial Motor Users' Association held at Leeds on Juue 14, the Lord Mayor said—"There have been many complaints against the motor coach owners' use of the roads. You come upon the road as if you owned it. You never did own it; you were only common users with other people. But I congratulate you upon this, that you have got at last an idea that there are other people who want to use the road, and now and then you will draw aside and let us pass. For these mercies I thank you." These facetious remarks were suitably received.

Duty on Electric Vehicles.—At Glasgow Corporation Cleansing Committee the Town Clerk reported correspondence with the police registrar as to the duty payable in respect of the electrically-propelled vehicles—22 in number—owned by the department, the duty, amounting to £584 8s., having been paid in terms of paragraph 5 of the Finance Act, 1920; that a claim for a rebate on the duty had been made to the Ministry of Transport, who intimated that they were prepared to licence the vehicles in terms of paragraph 6 of the Act, and had remitted the sum of £456 12s. as a rebate on the duty already paid.

New Roads in London Area.—The Minister of Transport has stated in the House of Commons that arterial or by-pass road schemes are being proceeded with as follow in the Metropolitan area—Brentford by-pass (5 miles), Croydon by-pass (4 miles), Eastern Avenue (8 miles), Eltham by-pass (4 miles), New Cambridge Road (7 miles), New Chertsey Road (short), North Circular Road (Willesden to Walthamstow), Shooter's Hill by-pass (3 miles), South Circular Road (begun in Woolwich), Western Avenue (Hammersmith and Acton), and Barking by-pass (4 miles). The schemes give employment to two thousand men, but the progress of the work has been interfered with by the coal strike. With the opening of the work on the Barking by-pass and Eastern Avenue roads it is hoped that employment will be available for a considerable number of men.

A Driver Rewarded.—The C.M.U.A. award of merit medal, which was instituted by the Commercial Motor Users' Association in 1911 for acts of distinction in connection with the use of commercial motor vehicles, has been awarded to Reginald Marshall, a driver in the employ of a haulage contractor at Manchester for his plucky conduct on April 18. Marshall was driving a lorry laden with slabs of concrete weighing 4½ tons from Manchester to Nelson. The brakes failed going down an incline, with the result that the lorry ran away and attained a speed of nearly 60 miles per hour. He pluckily held the steering wheel, although the lorry in taking bends was at times on two wheels, and pulled it up without mishap some distance ahead. Unfortunately one of the slabs flew off and killed a passer-by. Addressing the driver at the inquest, the coroner said his skill and nerve, displayed in a most trying situation, was really marvellous.

County Councils Association and Traffic Control.—At a meeting of the executive of the County Councils Association, the Parliamentary Committee reported that they had received a resolution of the Essex County Council requesting the association to consider the question of nuisances from motor coach pleasure traffic, and to urge the proper Government department to deal with the subject without delay by legislation or the framing of model by-laws. On a proposal from the West Riding County Council that it should be imperative for users of county roads by steam or motor wagons or coaches of over one ton load capacity to instal governors to be effective at twelve miles an hour, the Highways Committee expressed the opinion that the engineering difficulties were such as to render the scheme impracticable. The motor coach recommendation was adopted, but the question of speed governors was referred to the Highways Committee for further consideration.



Members of the Institution of Municipal and County Engineers conveyed by A.E.C. Motor Coaches to an inspection of King George's Reservoir during their annual meeting in London in June.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

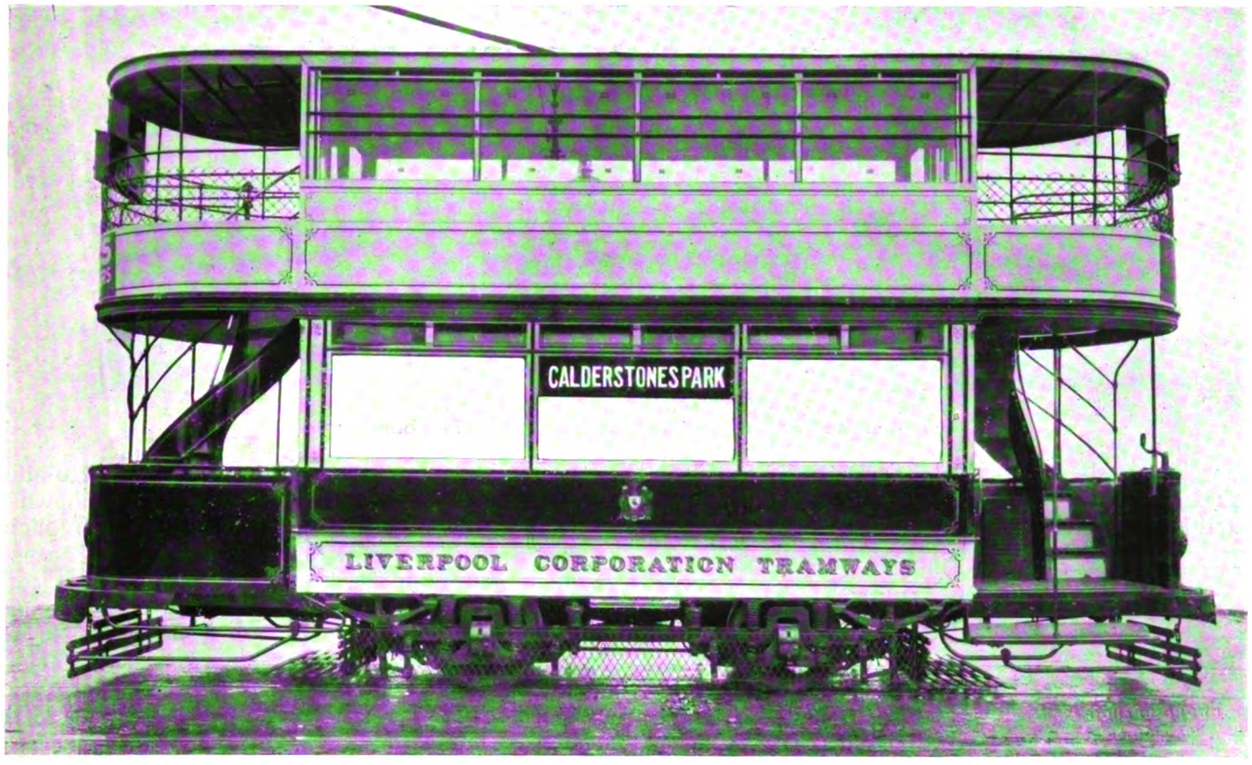
Founded 1892. LONDON, AUGUST 18, 1921. VOL. L.

LIVERPOOL STANDARD CAR.

NOTABLE IMPROVEMENT IN ROLLING STOCK.—FEATURES OF A 60-SEAT SINGLE TRUCK DESIGN.

Possessing their own body building and repair works, the Liverpool Corporation Tramways Department have been favourably situated for making the best of the position during the period of high prices and lessened production. It is due to the same advantage that the department was not more troubled than was the case by the condition of their rolling stock under the strain of the increased traffic of the war period, a time when little or no help was obtainable from outside car works. Notwithstanding that the Corporation Tramways Department became one of the most important munition works in the city, the cars received as much attention as possible, but there were, of course, enormous arrears of work to be overtaken when peace came.

With a return to something like normal conditions at the shops, Mr. P. Priestly, the general manager, has been able to make considerable progress with the renovation of the old rolling stock and with his scheme for turning out a standard car adapted to the main requirements of the traffic. The work has, of course, been enormously hampered by the long-continued industrial difficulties that have made impossible the orderly progress of the best laid plans. Mr. Priestly and his assistants have, however, now probably seen the worst of their troubles and recent visitors to Liverpool, who are at all familiar with tramway conditions, must have been struck by the improvements that are being effected in the rolling stock. The car illustrated on this page, is one of the new type, constructed to the designs of the general manager, and is of a neat, compact character, embodying, moreover, several noteworthy features. A glance at the exterior reveals the fact that a departure has been made in the type of lifeguard used. This was formerly a wooden frame of plough shape, completely encircling the truck. It was used for many years on all Liverpool's cars and was known as the Liverpool plough guard. It was, however, costly to maintain,



New Standard Car of Liverpool Corporation Tramways.

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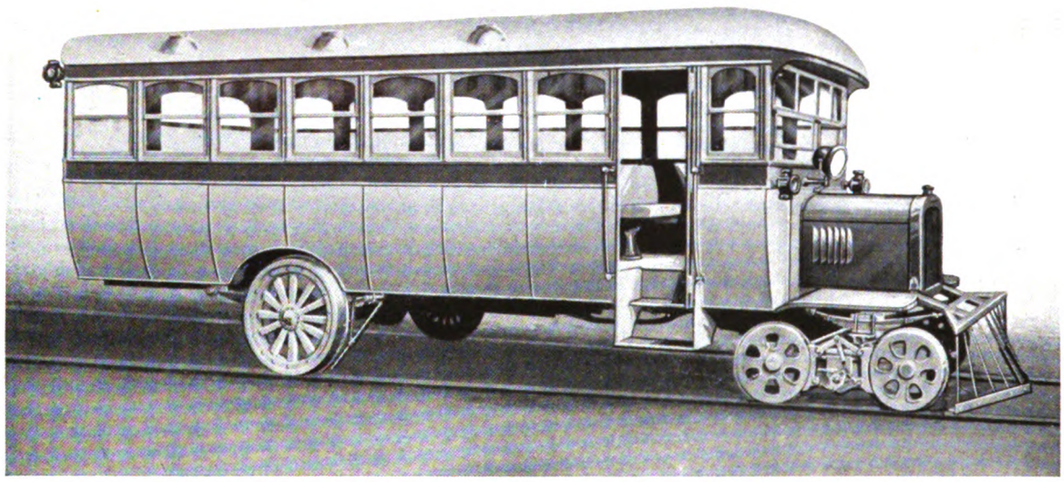
and it is now superseded by the Tidswell patent side and end lifeguards, with a wire guard running the full length of the body.

The principal features aimed at in the design of the car include—ease of ingress and egress, greater facility for cleaning both the lower and upper saloons by the reduction to a minimum of usual obstructions met with in car construction, and a simple but efficient system of ventilation. The lower saloon has seating capacity for 22, while on the upper deck 28 passengers can be accommodated inside, and ten on the canopies. Careful study has been made of the comfort of travellers in both saloons, and a liberal amount of seating space is allowed. The body is mounted on a single truck, manufactured by the J. G. Brill Company, with a wheel base of 7 ft. 6 in., and a spring base of 13 ft. The wheels are of 2 ft. 9½ in. diameter and the axles have a diameter of 4⅜ in. There are two Dick, Kerr motors of the D.K. 20 type, each of 40 H.P. Hand and electrically-operated brakes are fitted. The reverse brake controller is the Dick, Kerr K.3 type. roof with ash roof sticks, white oak being introduced for the cornice mouldings and doors, the whole of which are finished in the natural wood. The transverse seats are constructed entirely of maple, presenting a neat and clean appearance. A combined screen route indicator and number box is fitted at each end of the car. To the trolley base, twin ball races and a roller bearing are fitted, which reduce friction to a minimum. In its exterior decoration the car is painted and lined to Liverpool's standard colours.

MOTOR OMNIBUS FOR RAILWAY SERVICE.

High operating costs are a serious obstacle to the expansion of passenger services on all railways, and particularly is this so in the case of short lines on which the traffic is comparatively light. As a means of assisting railways in solving the problems of high cost, the J. G. Brill Company, of Philadelphia, have designed a passenger car built on an ordinary omnibus chassis



A Rail Motor Omnibus Built by the J. G. Brill Company.

The weight of the car completely equipped, but empty, is 11 tons 10 cwt. 1 qr.; the weight per passenger seated is 3·833 cwts.

The following are the principal dimensions—

Length over all	30 ft. 3 in.
Length of body	16 ft. 6 in.
Length of platform	6 ft. 0 in.
Length of platform over buffer	6 ft. 10 in.
Length inside body	15 ft. 9½ in.
Width over all	6 ft. 9 in.
Width of floor sills	6 ft. 0 in.
Clear height at centre of lower saloon ...	6 ft. 4½ in.
Clear height at centre of upper saloon ...	5 ft. 10½ in.
Total height from rail to trolley plank ...	16 ft. 1½ in.

The main structure is built of well-seasoned English oak, reinforced by substantial wrought-iron plates, floorings and roof of pitch pine, with waist rails of teak, and mahogany panels. The platform bearers are of stout angle iron. The interior is finished in white figured oak, with raised panels in quarters and doors, the roof being painted white, with transfers of a colour and tint which blend harmoniously, producing a very pleasing appearance. An inside destination screen indicator is fitted into the general moulding scheme of the lower saloon. For the upper saloon English ash framing is utilised, with mahogany panels, pitch pine with only such modifications as are necessary to allow of its being run on rails. The car which is shown in the accompanying illustrations has all the simplicity of operation of a motor omnibus and by its means a frequent and rapid service can be provided at comparatively low cost. The vehicle has been operated by one man acting as driver and conductor. It was built for the Chesapeake Western Railroad, and is mounted on a 2½ ton chassis, having four transmission speeds, both forward and reverse. In addition to the system of brakes on the small front truck, which is controlled through the shaft and wheel used for steering in the ordinary omnibus, there are also brakes on the rear wheels, while speed can further be retarded through the transmission. A foot pedal controls the rear wheel brakes, and a lever is used to apply the transmission brake. With an appropriately designed body the car can be used for carrying goods or for usual inspection purposes.

The four-wheel truck under the forward end secures steadier and consequently more comfortable riding, particularly on curves, than could be obtained with the two wheels and axle with which motor omnibuses for ordinary road service are equipped. This easier action is due to the swing links by which the truck bolster is

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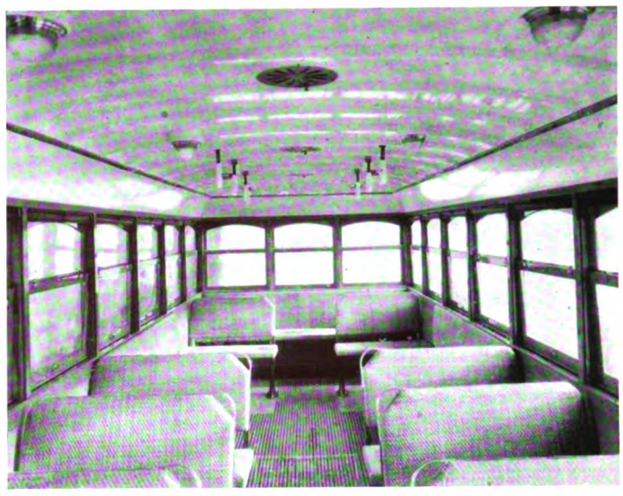
suspended, permitting sufficient lateral movement to provide easement where necessary. It has also been shown that the four-wheel truck adheres better to the rails under a high rate of speed. This truck is constructed of commercial steel shapes, has a 3 ft. wheel base, and is equipped with 20 in. diameter wheels.

Interior of Rail Omnibus, Looking Forward.

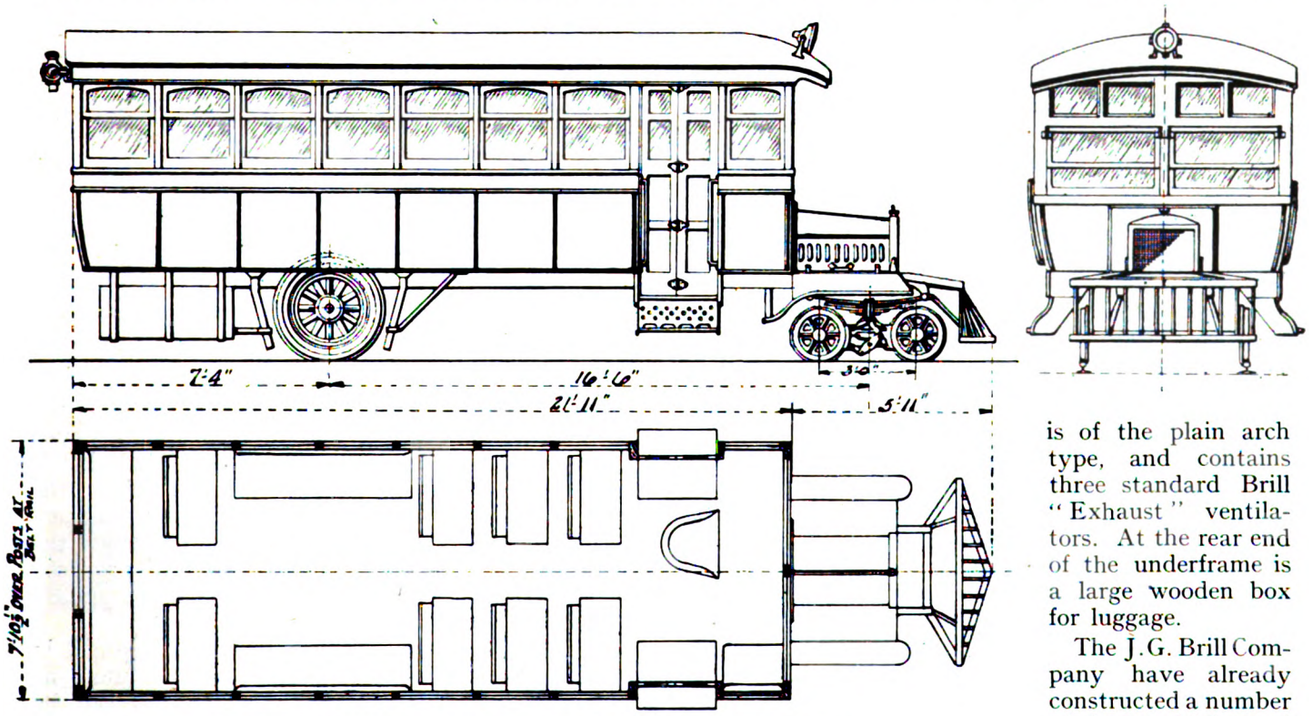


Rear End of Rail Omnibus.

A pilot is attached to the front, as a safeguard against obstructions on the rails.

In the construction of the truck illustrated the Brill Company has taken advantage of its long experience in designing electric tramway trucks, and many features are included in its construction which have been found satisfactory in electric railway practice. The trucks may be constructed for a gauge as narrow as 3 ft. $3\frac{3}{8}$ in. for standard gauge, or as wide as 5 ft. $2\frac{1}{2}$ in.

The body could, of course, be built to any required design, but the body shown in the illustration was built according to standard American motor omnibus practice. It has a composite underframe of ash side and end sills and crossings of 3 in. steel channels, ash corner and side posts in the superstructure, with sheet steel side sheathing up to the belt rail. It measures 21 ft. 11 in. long over corner posts, and has seating capacity for 31 passengers. All the seats are upholstered in Brill twill-woven rattan. The interior is of a sanitary ash finish, and greatly resembles the electric tramway car. All side and end windows are of the double type, the upper part being stationary and the lower arranged to drop into pockets. The two-leaf folding doors on each side of the forward end are controlled by the driver, through separate levers. The roof is of the plain arch type, and contains three standard Brill "Exhaust" ventilators. At the rear end of the underframe is a large wooden box for luggage.



Plan and Elevation of the J. G. Brill Company's Rail Motor Omnibus.

The J. G. Brill Company have already constructed a number of these vehicles and they are apparently being used with very satisfactory results. The cost of operating a car of this character will depend, of course, largely upon local conditions, but the car shown in the illustrations runs 9 miles on one gallon of petrol and one quart of lubricating oil for 200 miles. On a level track a speed of 25 to 28 miles an hour is attained.

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STANDARD RAILS AND THE RAIL REMODELLING SYSTEM.

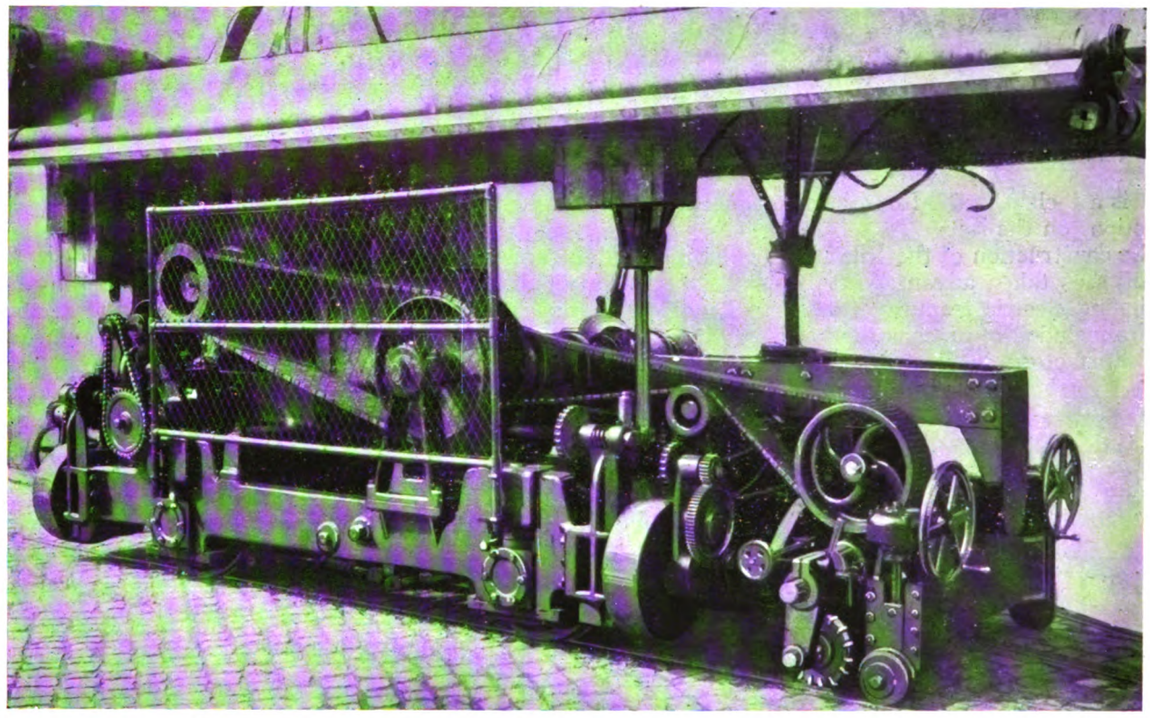
By Arthur G. Conway.

The demand for improved tramway facilities, together with the increased road traffic has brought about many new problems for those in charge of tramway transport. Among the most important changes that had to be made were heavier cars to give more seating accommodation and higher speed. This naturally increased the wear on the rails.

The high cost of track renewals during the war period compelled the majority of tramway undertakings to get the longest possible life out of their tracks, but this has in many cases only resulted in rails having to be scrapped to-day when the cost is still in the neighbourhood of the highest point reached. The year 1904 saw the majority of the British electric tramways brought into existence, and to-day, 17 years after, many systems still have the original rails in use. During this period the advance in road traction generally has exceeded the most sanguine expectations.

The Engineering Standards Committee in 1903 recommended certain specifications and sections to be adopted as the British standard of rails. In all cases the groove on straight track was $1\frac{1}{8}$ in. and on curves $1\frac{1}{4}$ in. With these rails a wheel flange of $\frac{9}{16}$ in. has generally been adopted, thus leaving $\frac{9}{16}$ in. wear in the rail head before bottoming is started. When the $\frac{9}{16}$ in. is worn off there still remains on the standard sections sufficient metal in the rail to give several years additional wear, but such further wear unless the groove is deepened is far more rapid than the first $\frac{9}{16}$ in.—caused by the flange setting up a grinding or milling operation in the bottom of the groove, which invariably cuts into the side of the check. The oscillation of the tramcar then brings excessive pressure on the weakened check, resulting in breakage.

The Engineering Standards Committee are now considering the adoption of a new section with a depth of groove of $1\frac{1}{2}$ in. which, with the ordinary flange, will give a wearing capacity of $\frac{15}{16}$ in. against the $\frac{9}{16}$ in. of the old type, representing additional life of 66 per cent. In the proposed section there appears to be no alteration of design in the floor of the groove to provide for increased leverage on the check of the rail, and this is a point which should not be overlooked. It has even been suggested that because the present type of rail can be regrooved to the extent of leaving only $\frac{5}{16}$ in. in the bottom, the new type of rail should have this thickness only. This, however, is quite inadequate, because a rail that has been deepened has also had the check considerably reduced, and when remodelled the leverage is in the same proportion to that of a new rail. Recently a test was carried out on a 2 foot section of old rail milled out to $\frac{15}{16}$ in. deep, with check reduced to the level of the tread and with $\frac{5}{16}$ in. of metal in the floor of the groove. The weight was applied along the top of the check up to breaking load, which proved to be 21·4 tons. It will be fully appreciated that if the check of the rail had been $1\frac{1}{2}$ in. in height, the breaking load would have been considerably reduced. There should, therefore, be a tendency to increase the thickness of metal below the groove in any rail proposed with a groove deeper than the present British Standard section.



Woods-Gilbert Rail Remodelling Machine in Use on London County Council Tramways.

Most of the old sections of rail can be deepened in the groove with advantage, but great care must be taken in the operation, otherwise the rail can be irreparably damaged. The Woods-Gilbert Rail Remodelling Company's machines have already demonstrated their utility. The company were the originators of rail remodelling *in situ*, and have had over 17 years' experience in this class of work. The original machine was designed in Australia for deepening the groove by means of an end mill, and for cutting down the fishplates of tee rails by means of a side

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milling cutter. The power for this was provided by a small petrol motor.

This machine was improved by the adoption of an inserted tooth rotary cutter, but only one rail at a time could be treated. It was designed to permit of conversion to a grinder. Originally it was driven from a petrol motor, but was afterwards converted to electric power. Later a new type of machine was designed for milling the lip and groove of both rails simultaneously. The machine was also fitted with heavy transverse wheels to permit of it being side-tracked when not engaged on remodelling. It has remodelled many miles of rail in this country, and it is still in service. It is this machine which a large number of tramway engineers have from time to time inspected in operation, and have been favourably impressed with its excellent work, but a superior machine has since been designed.

From experience gained, it became apparent that a more mobile machine, capable of undertaking both grinding and milling work on various gauges existing in this country, was required. The chief feature of this new machine is that it has a main truck mounted on four running wheels, and powerful springs. The power is derived from a 50 H.P. electric motor, which takes its current from the overhead or conduit system. When travelling the machine can attain a speed up to 20 miles per hour, and the attachments designed for milling or grinding are then suspended clear of the track by means of a cantilever mounted on the main truck. On arrival at the working position the attachment is lowered on to the rail. The milling attachment, which is connected to the cantilever by means of trunions, is of box section, containing powerful compound gearing and is supported on the rails by guide rollers fitted to both sides of the attachment.

The traverse of the machine is obtained by means of worm reduction gear mounted on the main truck, which will give a variable feed of from 6 in. to 18 in. per minute. The machine reduces the high check and deepens the groove simultaneously on both rails or on one rail only. The average speed of the machine is approximately 100 feet per hour.

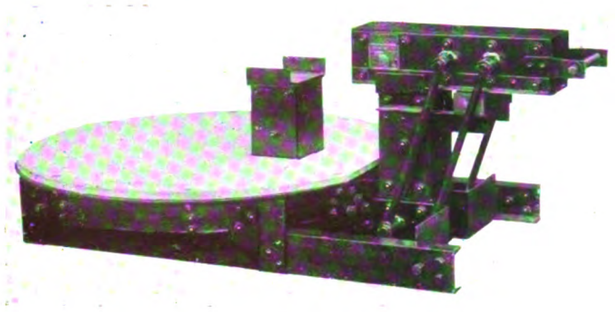
When grinding work is to be undertaken, the milling attachment, together with the trunion brackets, are removed and a grinding attachment is then connected to the cantilever by means of a flexible sling and to the frame of the main truck by means of a universal coupling. The grinding attachment is longitudinally divided, and is supported on the rails by means of four sets of multiple rollers, two on each side of the attachment placed front and rear of the 24 in. grinding wheel. When grinding, the feed is obtained by means of worm and friction drive, which gives a reversible traverse speed of about 16 feet per minute. The two halves of the attachment are dovetailed together and rock on a centre spigot. The four corners of the attachment being supported on multiple rollers allows the surface of both rails to be simultaneously treated irrespective of all irregularities at a speed of 120 feet per hour.

The London County Council have two of this class of machine in operation on milling work, one of which is illustrated on the opposite page, and the company have others at work in different parts of the country.

TRAMWAY CURVES.—Bradford Tramways Committee recently applied for sanction for the borrowing of moneys required for reconstruction of tramway tracks. It was pointed out that in the relaying of curves provision should be made for the minimum clearance space of 15 in between passing cars. Instructions have been given to act as a general principle in accordance with the foregoing requirement when reconstructing curves.

NOVEL WAY OF HEATING TIRES.

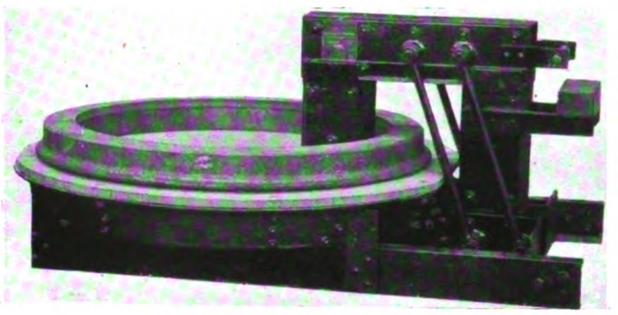
The present method of heating tires used in nearly every tramway depot cannot be said to be very efficient, especially in these days when fuel economy is of the utmost importance. The majority of depots use a large gas heating ring, while others use coal or coke, with the usual waste attendant on such methods. The obvious drawbacks to these systems are many. Irregular heating will cause distortion of the tire, with the result that, if placed upon the wheel centre, there is an imperfect fit all round. Where coal or coke is used



Yoke of Heater Open to Receive Tire.

there is the vital necessity to remove carefully all clinging cinders or scale before the tire is applied to the centre.

Those who have experienced these difficulties will appreciate the advantages gained by the use of the apparatus shown in the accompanying illustrations. This device, which is of Swiss origin and has been already adopted in some continental tramway depots, embodies a principle whereby the tire becomes the secondary of a transformer. In the first illustration the heater is shown with the yoke open ready to receive the tire, which is laid flat upon the circular bed of



Tire on Bed of Heater.

insulating fireproof material as shown in the second illustration. The movable core is then pushed over to close the magnetic circuit of the transformer, and single phase alternating current is applied to the primary coil situated on the lower limb of the core.

The tire quickly heats up under these conditions with an absolute uniformity of temperature all round. There is, therefore, no distortion while the tire remains clean and ready to be applied to the wheel centre. The speed of attaining the desired temperature is from 15 to 30 minutes, depending upon the consumption of current used, the size and resistance of the tire and the local conditions regarding freedom from draughts, etc. The power required is approximately 25 KVA. The total weight of the apparatus is approximately 9 cwts.

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The device unfortunately requires a supply of alternating current, which few depots possess. In such cases it would be necessary to install a motor-driven alternator and in anticipation of this fact the designers have developed such a machine for operation upon traction circuits of 500 to 550 volts. This machine is equally available for other work where alternating current is essential, such as resistance or spot welding. Other depots which already have an alternating current available are not concerned with this difficulty, and the primary coil of the transformer can be wound for any voltage and periodicity.

The agency for the apparatus is held by the Equipment and Engineering Company, 2 and 3 Norfolk Street, Strand, London, W.C., for whom those interested would receive ready information.

HUDDERSFIELD'S NEW CAR SHED.

OPENING OF A BUILDING ACCOMMODATING 100 CARS.

A new tramway car shed at Longroyd Bridge, Huddersfield, was formally opened on July 15 by the chairman of the Tramways Committee (Alderman E. H. Sellers). After Alderman Sellers had been presented with a gold key by the contractors (Harold Arnold and Son, Limited, Doncaster), he opened the door and drove into the shed the first car. The deputy chairman (Councillor T. Canby) followed, driving the first motor omnibus into the shed.

The borough engineer (Mr. W. Jaggar) stated that the building, which was of fireproof construction, was a reinforced concrete structure, and was unique of its kind. The aggregate for the concrete is composed of clinker from the gas and electricity works, with a small percentage of sand added to form a mixture for producing concrete of the necessary strength. The walls are doubly reinforced with mild steel bars ¼ in. in diameter, with 18 in. centres, placed vertically and horizontally. The roof principals are supported on

Recreation Room.

columns and stanchions, reinforced with old Corporation tramway rails, and ¼ in. bars in addition. The roof is composed of steel, covered with Trafford tiles and Helliwell's patent glazing.

The main shed has a frontage to St. Thomas' Road of 155 ft., and extends in a northerly direction to the River Colne for a depth varying from 310 ft. on the east side to 254 ft. on the west side. The total area of the site is 1 acre 273 sq. yards, which is entirely covered with the building. The accommodation provided consists of the shed for the housing and cleaning of cars, dining-room, kitchen, lavatories, cloak-room, pantries and store-rooms (all on the ground floor), and recreation-room, size 50 ft. × 20 ft., on the first floor. The shed is divided into three bays, the two outside spans being 49 ft. 6 in. and the centre span 56 ft. 6 in. Accommodation is provided for housing 100 cars. There are 13 lines of track in all, with pits for inspection purposes, and all the movements of the cars are effected electrically from overhead trolley wires. One of the pits is provided with a movable platform, and when in

Dining Room.

position this portion of the shed will be available for the housing of motor omnibuses.

Offices are installed inside the entrance to the building, one for the foreman in charge and the other for use as a cashier's office. The dining-room has a seating accommodation for 64 persons. Adjacent is the kitchen, fitted with modern cooking appliances, replete with all necessary equipment for efficient service. The dining-room and recreation-room are heated by radiators supplied by J. Wright and Company, of Birmingham, who were the contractors for the whole of the heating installation. This part of the building has been designed with special consideration for the comfort and convenience of the employees.

The actual cost of the building (all trades) is £44,698. The cost of the permanent way, including points and crossings fixed and laid complete, is £4,611. The cost of the overhead equipment and lighting amounts to £2,380, making a total expenditure of £51,689. With a garage accommodation for 100 cars this is equivalent to £517 per car. The annual charges, consisting of interest and sinking fund spread over a period of 40 years, amount to £25 8s. 8d. per car per annum.

The tramways manager (Mr. A. A. Blackburn), in formally accepting the building, said the shed was to be used as a running shed only. At the other depots they hoped to be able to begin construction of their own cars; they were already converting and rebuilding the old cars.

Alderman Sellers said it was a rather unique thing that not a single car in their service had been scrapped. Going back 20 years they found the following comparisons—Revenue, 1901, £37,702; 1921, £275,407. Passengers carried—1901, 6,080,000; 1921, 35,203,000. Miles run—1901, 600,000; 1921, 12,782,703. From 1883 to 1905 they received from rates £73,041, which had been paid back, together with interest of £6,937.

The Mayor, on behalf of the contractors, presented the deputy chairman (Councillor Canby) with a silver rose bowl as a memento of the occasion.

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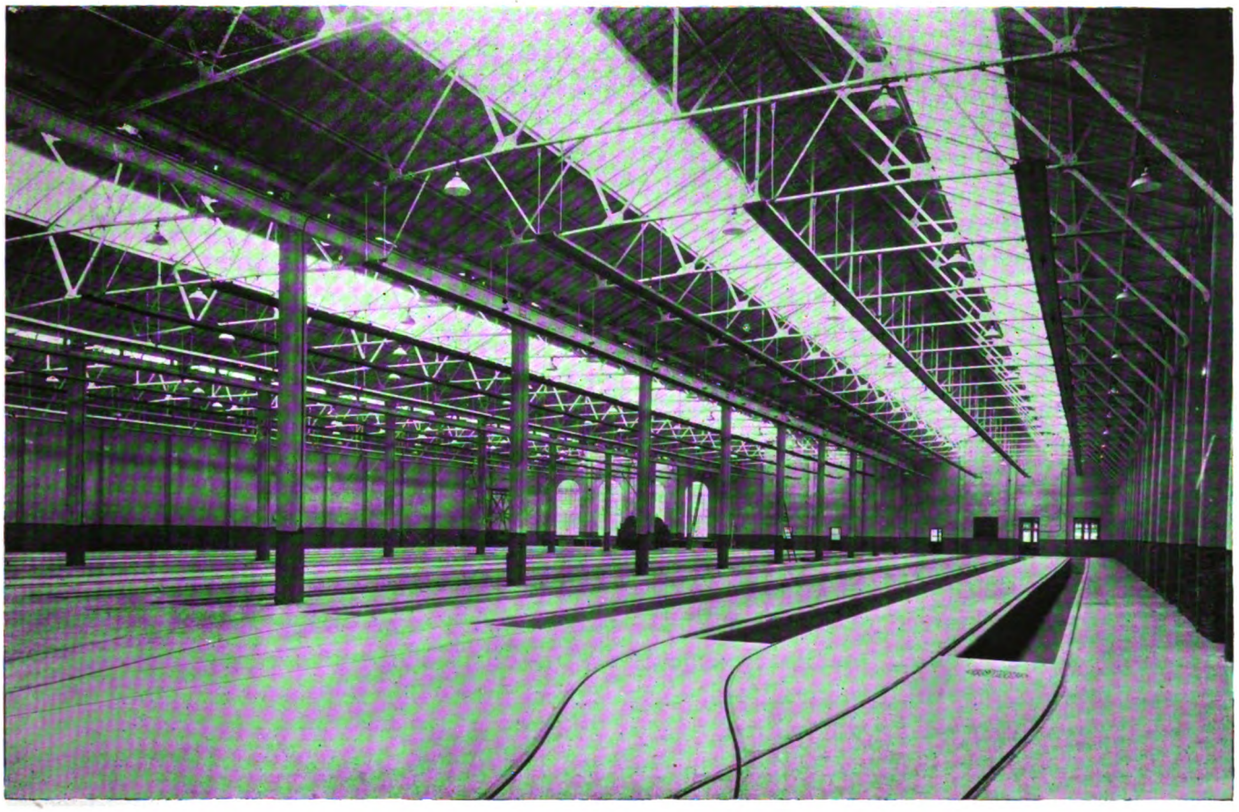
View showing the front elevation to St. Thomas' Road.



The interior of the Shed.

HUDDERSFIELD'S NEW CAR SHED.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, AUGUST 18, 1921.

London Tramway Extensions.

The past month has seen the completion of two important additions to the London County Council Tramways. The inauguration of the new line from Mare Street through Burdett Road to the West India Docks, and that along Wandsworth High Street and East Hill—especially the former route—are most useful adjuncts to the system. The new line which crosses the East End is some three miles in length, and forms a much-needed convenience in this busy industrial area. Not only does it directly link up the Docks with the north-eastern suburbs, but incidentally it may help to relieve the housing congestion by enabling riverside and other workers to live further from the scene of their occupation and in a more open neighbourhood. The route cuts through Victoria Park—the "lung" of the East End—and among the lines with which it connects are those to Stamford Hill, Leyton, Ilford, East Ham, and Barking, besides a link with the City itself. The new route at Wandsworth, in south-west London, makes possible for the first time a through service from Victoria *via* Clapham Junction to Putney, Hammersmith, Shepherd's Bush, and the Harrow Road. The opening of these two routes should draw public attention to other urgent needs for such extensions, and to the London County Council's recent decision not to seek further powers for tramway extensions in the next Parliamentary session. Commenting on this decision, a contemporary remarked that "it certainly appears that the tramway has reached, for the time being, the limit of its possibilities . . . there can be no more extensive tramway schemes." The Council, on the contrary, are fully alive to the need for such developments, but are wise in refusing to waste the ratepayers' money in a thankless endeavour, under present conditions, to obtain the requisite sanction. Their action is no admission that further tramway extensions are undesirable, or that the usefulness of this method of transport has reached its limit; it is merely a recognition of the fact that any attempt to secure powers in existing circumstances, and having regard to the lack of co-ordination between the authorities that control London's traffic, is doomed to failure. Whenever a municipal body or private company has come forward with a plan for increasing tramway facilities in London, the scheme has almost invariably been frustrated, very largely by Scotland Yard. This state of affairs emphasises the urgent need for a central traffic authority for the metropolis. Such a tribunal would approach the consideration of each scheme with an unprejudiced outlook and a determination to secure the promotion of those plans which promised the greatest good to the greatest number. It cannot be said that this has been the criterion in the past. Even in the case of the East London line, to which reference is made above, the work was held up for a considerable time by the refusal of one local borough council to sanction the installation of overhead equipment. Surely it is time that an authoritative body should be constituted that would take a wide view of these matters and would ensure that the public convenience shall not suffer from the selfish obstruction of some prejudiced authority or by the parochial short-sightedness of any individual body. Were a committee such as we have so often advocated in existence, its sanction, once given, to tramway or other schemes would mean that the work

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would go ahead without delay. That there is a desire for co-operation to this end on the part of several local authorities is indicated by the working agreement entered into between the London County Council and the Leyton Council, with its attendant extension of cheap midday fares, and the more recent arrangement by which these fares have been extended to the West Ham Tramways.

London Omnibus Workers' Attitude.

To whatever form of public passenger transport they may be indebted for their livelihood, the employees of such undertakings can gain certain lessons from the refusal of the London omnibus workers to accept the provisional agreement made with the company by their union officials. The first embraces the old axiom that it is folly to kill the layer of the golden eggs, a truism which manual workers often seem incapable of grasping. A second, not less important, is the fact that workers engaged in public service must within reasonable limits not expect to work hours suited only to their own convenience. The omnibus workers have entirely forgotten that necessity, or they would not have voted for adherence to an eight-hour spell of duty performed in a maximum period of ten hours, instead of from twelve to thirteen hours. As in the case of tramway undertakings, the company greatly increased their working expenses when the eight-hour day was conceded, and they can no longer continue to keep the maximum number of vehicles running during the slack hours merely to permit of men putting in their eight hours. No undertaking can cater satisfactorily for the public if it cannot add to the rolling stock at the hours when the traffic requirements need the extra facilities. The men seem to forget that transport undertakings had considerably to augment their traffic staff in order to grant the eight-hour day, and that during the past two or three years the pooled receipts of the Underground Companies have had to be drawn upon for the dividend. Even if that were not so it would be bad finance to build further omnibuses and garages and engage more men in order to maintain an unremunerative spread-over. Moreover, the safety of the public must be given a thought in relation to the fondness of the drivers for working their eight hours in two equal parts. While the industry has not been long enough in existence to determine what will be the "life" of a driver, both drivers and conductors would be well advised to conserve their vitality by accepting the shorter spells which the company desire to institute. The provisional agreement offers a good return for such a concession. The proposed terms comprise the continuance of the present wages until January next; payment for eight hours if only six hours are worked; spare men guaranteed the 48-hour week; overtime rates if more than eight hours are worked; pay of conductors to be brought nearer to that of drivers; time-and-a-quarter to be paid for Sunday duty; two days added to the holidays; and work to cease at five instead of at six o'clock on Christmas Day. Perhaps the employees will indicate how the company are to give those advantages if they are not allowed to cater efficiently for the traffic.

Scotch Cities and Omnibus Powers.

After hearing evidence on behalf of the Dundee City Council, the Parliamentary Commissioners at Edinburgh found the preamble not proved, the chairman remarking "that no precedent had been quoted as to the running of pleasure trips of the sort desired by the Corporation." For the Commissioners to designate the intention of the Corporation as a desire to run pleasure trips is, it seems to us, entirely to disregard the major part of the evidence. The only allusion to pleasure trips was contained in the statement that it was proposed to give facilities for visiting the Corporation's "estates." During the summer months three-fourths of the omnibus traffic outside of the towns in any part of the Kingdom may be regarded as coming under the designation of "pleasure." As other Scottish cities desire to secure powers to run omnibuses outside of their boundaries it is satisfactory to note the Dundee tramways manager has reported that the Municipal Tramways Association propose to move for general legislation giving the required powers. Numerous instances may be cited in England in support of that course, and in view of the competition from coaches and omnibuses which the Dundee and other tramway undertakings have to endure, it is only just that the latter should be able to cater on terms of equality.

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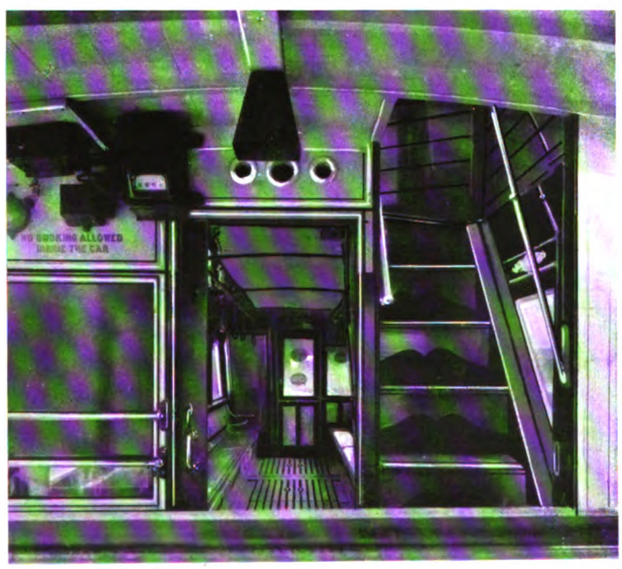
SALFORD'S RECONSTRUCTED CAR.

The Salford Corporation Tramways Department have recently reconstructed one of their bogie type of car on thoroughly modern lines—as will be seen from the accompanying illustrations, for which we are indebted to Mr. G. W. Holford, the general manager. A new outer deck cover has been provided enclosing the whole of the upper deck. Vestibules have been erected on the two ends of the lower platform and the "Hatton" type of platform and staircase has been adopted. This allows passengers to leave the car at the motorman's end, while others are boarding at the conductor's end. A great saving in the time occupied by loading and unloading, particularly at the busy town termini is thus effected. As it was not desired to increase the length of the end platforms (which would mean considerable trouble and expense in altering the present or providing new steel underframes), the staircases to the upper deck are carried through a portion of the lower saloon, which has meant sacrificing two seats in this portion of the car, but the counter benefits derived are well worth the reduction. In order to remove any complaint of draught on the upper deck—caused by the open exit on the lower platform—a neat partition has been fixed at either end with sliding doors, which can be opened or closed as desired. The double type of indicator box is fitted and can be operated by the conductor through a drop sash window on the right-hand side.

Salford Car as Reconstructed with Vestibules and Inside Stairways.



The Inside Stairway.

Interior of Upper Saloon.

The seating accommodation is 30 in the lower saloon

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on longitudinal seats and 44 in the upper saloon—32 transverse seats, with semi-circular seats at each end holding six passengers. The length of the platform is 5 ft. and in order to avoid the setting back of the brake gear to enable the usual type of horizontal brake handle to be used—which, if altered, would occupy a considerable portion of the platform—a vertical brake equipment has been provided, which is working very satisfactorily. The car has been in service for several weeks and has been highly commended by those of the travelling public who have had an opportunity of using it.

GENERAL ELECTRIC COMPANY'S NEW OFFICES.

On the occasion of the annual meeting of the General Electric Company, Limited, on July 21, the handsome new head offices and showrooms at Magnet House, Kingsway, W.C., were thrown open for inspection. The former headquarters in Queen Victoria Street had been occupied by the company for over 32 years, but the growth of the firm's business to its present world-wide extent made desirable the erection of the spacious and imposing building in Kingsway.

Magnet House, from an architectural point of view, is certainly an acquisition to the comparatively new West Central thoroughfare. Situated nearly midway up on the left-hand side (proceeding from Aldwych), its fine conception and harmony of design command the attention of the passer-by. The main facade, here illustrated, was designed by Mr. R. Frank Atkinson, F.R.I.B.A., and strikes a distinctive and pleasing note. A tour of inspection which was recently made, leaves the dominant impression that everything possible has been done to meet the comfort and convenience of customers who may call personally, while the arrangements to fulfil their orders with prompitude and accuracy are abundantly evident. Modern labour-saving devices, specially designed to meet the particular circumstances, have been adopted on every hand. It is hardly necessary to add that the whole of the electrical equipment and fittings are products of the General Electric Company or of its associated companies.

The building covers a ground area of 25,722 sq. ft. and has eight floors, including the basement. Each floor is divided into eight sections by brick walls, fitted with double iron fireproof doors, of which there are 130, all made by the company at their Fraser and Chalmers' Engineering Works, Erith. Five staircases give access to the various floors, which are also served by seven passenger and eight goods lifts, made and erected by the Express Lift Company. This firm was also responsible for the complete system of hoists and runways for loading and unloading vans and lorries, and for handling bulky goods. The lift equipment, comprising a total of 23 machines of various types, forms a complete epitome of modern practice in lift design and construction. An elaborate and expeditious system of dealing with inter-departmental correspondence by pneumatic tubes is in vogue. The central exchange for this service also distributes the incoming mail.

The main entrance hall, illustrated on page 80, is eminently prepossessing and stately. The floor is of marble, the walls of stone, and the combination forms a splendid background to the picturesque bronze gates and fitments. A wide marble staircase, in the well of which runs two high-speed passenger lifts, leads from the basement to the sixth floor and at each floor opens out to a spacious vestibule.

The basement contains extensive showrooms, in which is a widely diversified and comprehensive selection of electrical goods in which the company specialise. Fully realising the value of displaying their products in appropriate surroundings, the management have installed a beautifully decorated suite of rooms for the exhibition of electric light fittings and the demonstration of domestic electrical appliances. The rooms are so arranged that any scheme of interior decoration, or period style of furniture, can be matched with suitable fittings. There is also a large industrial showroom, housing a wide range of lanterns and fittings for factory and street lighting, ships fittings and other items of electrical equipment for ships, switchgear, telephones, electric light supplies, cables and wiring

New Offices of the General Electric Company.

materials and other products of the company. One interesting feature is a board demonstrating the company's new surface wiring system—"The Kingsway." A certain amount of the wiring in the industrial showroom is also carried out by this system.

The greater portion of the ground floor is taken up by the sales counters, which form a continuous line 140 feet long. Considerable storage accommodation is arranged behind the counters, and the bins can be quickly replenished from the main stockrooms on the upper floors by means of electric service lifts operated by a system of push buttons. The salesmen are in telephonic communication with their departmental stockrooms, so that in the event of any required article not being available at the counter, instructions can immediately be given for it to be sent down by these lifts. Under the counter runs a silent belt conveyor, which carries customers' purchases to separate packing

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benches at one end, relieving the salesmen of the task of tying up parcels. This belt conveyor—another product of Fraser and Chalmers' Engineering Works—consists of a rubber-covered duck belt running over idlers mounted on a substantial steel frame.

The arrangements for handling incoming-goods are equally up to date. In the van dock at the rear of the building (shown opposite), are three cranes and runways for this purpose, handling incoming goods. Cases are lifted from the lorries and lowered to the receiving department in the basement. Here the goods are unpacked, and distributed by lifts to the stockrooms on the fourth and fifth floors.

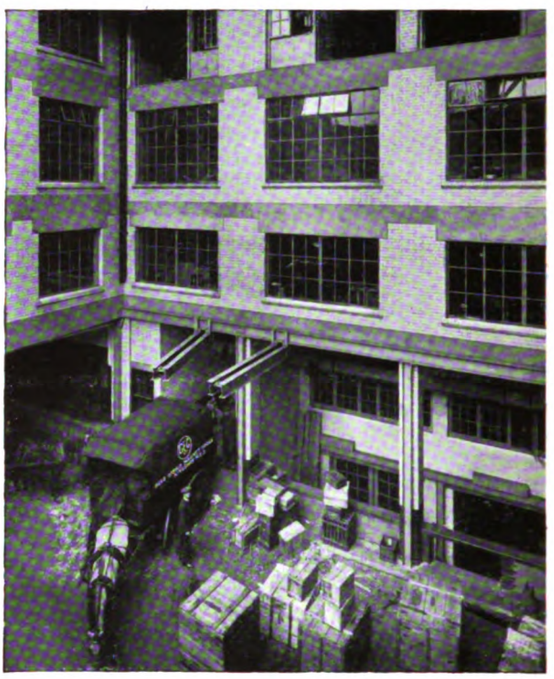
The first and second floors are principally devoted to administrative departments, including the spacious counting house on the first floor, the board room and the catalogue and information bureau on the second floor. The offices of the departmental managers and the large departmental general office are also situated on the second floor. Numerous signs in prominent positions direct the enquirer to the various departments.

The despatch department on the third floor is an admirable instance of systematic arrangement. The visitor is faced with rows of bins and packing benches and is informed that to each despatch clerk is allotted a definite section of the alphabet, so that he always deals with all the orders of every customer in his section. Adjoining the despatch department is the packing room. Goods are delivered to the despatch department by goods or service lifts and the completed packages are lowered in special containers by combined cranes and runways into waiting lorries in the van dock below. The stockrooms on the fourth and fifth floors are equipped with some 12,000 steel bins and are arranged on a definite plan to facilitate the work of looking out goods for the execution of orders. The private telephone exchange, which has 50 incoming lines and 300 internal extensions, is on the fifth floor. The equipment was manufactured by the Peel Conner Telephone Works.

The Entrance Hall.

The offices of the illuminating engineering department, a large and well-lighted office for fixtures-design and a meter test room and workshop, are on the sixth floor. Near by is a large staff canteen, fitted with a complete equipment of the company's well-known "Magnet" cooking apparatus, including urns, hot water calorifiers and hot plates. A large lecture hall is also situated on this floor. It has a seating capacity for 350 people, and is used for the social recreation of the staff, as well as for lectures on technical and commercial subjects. The motor rooms for the various passenger and goods lifts are on the roof, which is reached by four emergency staircases.

The general impression left by a visit to Magnet House is that the careful formulation and subsequent execution of the design and equipment for such a building has been a formidable task. That this task has been adequately fulfilled we imagine will be the verdict of all those who accept the company's invitation to make a call.



Van Dock and Runways.

RAILWAY DECONTROL.

The Duties of Efficiency and Economy.

Mr. F. J. C. Pole, the recently appointed general manager of the Great Western Railway, has written an interesting article for the August issue of the *Great Western Railway Magazine* on "Railway Decontrol." What will happen in the immediate future is, he says, a question which not only directly concerns every employee of the company, but is in a large measure dependent upon the individual exertion of each one of them. Henceforth the receipts of the undertaking must be made to exceed its expenses by a margin sufficient to pay a reasonable dividend to those who have found the money to provide the property and plant by which the industry is carried on. To-day railways are confronted with a difficult outlook. Trade has been injured by causes with which everyone is familiar. On the other hand, railway transport has more formidable competitors than hitherto. These competitors, moreover, are favoured by having a road provided for them largely at public expense, and in many cases the vehicles represent purchases of Government lorries at bargain prices, while the railways have to bear the handicap of high prices of materials and labour. These conditions have to be faced, and it is the manifest duty of every employee to use every means in his power to increase the company's business, to promote efficiency, and to effect all possible economy. The railway urgently needs more traffic, and Mr. Pole urges every employee to give full, immediate, and courteous attention to every inquiry made by the public, and to spare no effort to ensure efficiency and to give satisfaction in every kind of service. Although these comments are made solely in reference to the Great Western Railway, they are applicable to every other railway, and, indeed, to any tramway in Great Britain. Similar conditions obtain on all undertakings engaged in transport and all are faced with similar problems.

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Tramways & Light Railways Association.

Annual Meeting and Congress held in London, July 15, 1921.

DISCUSSIONS ON TRACK MAINTENANCE AND ELECTRIC WELDING.

ANNUAL MEETING.

The twenty-fourth annual meeting of the members of the Tramways and Light Railways Association was held on Friday afternoon, July 15, in the Council Chamber, Caxton Hall, Westminster. Mr. C. G. Tegetmeier, the Chairman of the Council, presided.

The Secretary (Mr. A. de Turckheim, O.B.E.) read the notice convening the meeting and the auditor's certificate.

The Chairman then moved the adoption of the report of the Council and statement of accounts for the year ended December 31, 1920, and after referring to the satisfactory financial position, delivered the following address.

ADDRESS BY THE CHAIRMAN.

In reviewing the work of the Association for the past year, we must regard it in conjunction with the work done by the Conference of Tramway and Light Railway Companies. The conference, as you are aware, is a separate body constituted within the Association for the purpose of dealing with matters concerning the tramway industry in relation to the interests of the company undertakings, more particularly with regard to labour and wages questions. The representatives of the company undertakings on the Council of the Association form the Executive Committee of the Conference, and meetings of the whole of the members of the conference are called when matters of importance arise for discussion. One of the important functions of the conference is to elect representatives of the companies to the National Joint Industrial Council. The Municipal Tramways Association have a somewhat similar organisation for dealing with matters in relation to the interests of Municipal undertakings, and in the Tramways and Light Railways Association representatives of company undertakings and representatives of municipal undertakings meet on common ground and deal with matters of common interest.

WAGES AND FARES.

During the past year, as in the two preceding years, labour and wages questions have constituted the most important matters with which we have had to deal, and much time and work have been devoted to them by the representatives of the undertakings on the National Joint Industrial Council. At the commencement of the year the war bonus stood at 34s. per week as the result of an award of the Interim Court of Arbitration in October, 1919. At the date of this award the index figure of the cost of living, as published by the Ministry of Labour, was 120 per cent. above the pre-war cost, and it gradually rose to the highest point touched, viz., 176 per cent. in November, 1920, from which it fell in successive months to the present figure of 119. Early in the year local applications were received for various increases in wages, which culminated in February, 1920—when the cost of living figure stood at 130—in a national application before the Joint Industrial Council for an increase of 10s. per week. Lengthy negotiations at the Council took place, and eventually a mutual agreement was arrived at in March under which the employees were to get an increase of 6s. per week, or a total war bonus of 40s. The agreement was received with considerable dissatisfaction by the employees in various districts and much unrest followed, resulting in many local strikes. In the case of some undertakings an increased advance was granted, and ultimately it was agreed at the Joint Industrial Council that the undertakings should be graded by the various District Councils into three groups, according to local conditions and financial capacity, and that there should be added to the basic rate of wages in the three groups 3s., 2s., and 1s. per week respectively.

With the payment of these increased wages and the general increase in the costs of operation and maintenance without any corresponding increase in the statutory limitations of fares, the financial position of the large majority of tramway undertakings in the Kingdom reached a very acute stage. Deputations from the Joint Industrial Council waited upon the Minister of Labour and the Minister of Transport, and the serious position of the industry was fully gone into. After investigation by Government officials, the Ministry of Transport admitted that the industry required immediate relief, and as a result the Government introduced and passed through Parliament the Tramways (Temporary Increase of Charges) Act, 1920, empowering the Minister of Transport to modify the statutory provisions regulating the fares to be charged, which received the Royal Assent on May 20. An important feature of the Act is that recognition is given to the principle that modification of fares may be authorised to an extent sufficient to provide for a reasonable return on the share capital. To obtain an Order under the Act authorising an increase in fares, application has to be lodged with the Ministry of Transport. The basis upon which the application is submitted is the financial position of the undertaking, and for determining the cost of labour for the purposes of the Act regard is had to the rate of wages fixed by the Joint Industrial Council. Up to the present date 75 undertakings have obtained Orders under the Act, and have increased their fares accordingly, while many other undertakings were able under their private Acts to increase fares without obtaining further powers.

COURT OF INQUIRY.

The next development in labour matters came in October last, when an application on the part of the employees was made before the Joint Industrial Council for a further national increase of 12s. a week. The representatives of the company undertakings on the Council at once declined to entertain the application, and while the municipal representatives adopted a somewhat different course, in the end both municipal and company representatives were agreed in the statement to the Minister of Labour, who had intervened, that the undertakings were unable to grant any increase whatever, and that they declined arbitration by the Industrial Court, or by any other form of tribunal. In these circumstances the Minister of Labour set up a Court of Inquiry under Part II. of the Industrial Courts Act, 1919, which held its first meeting on January 11.

The course of events following upon the setting up of the Court of Inquiry belong to the present year, but it may be well to complete the story and bring the review of the position up to date. After a very exhaustive inquiry the Court issued their report and recommendations on February 25, the salient feature of it being a recommendation that the wages standard then existing should be maintained until December 31, 1921. This recommendation was urged upon the Joint Industrial Council by the representatives of the employees, but the representatives of both the municipal and company undertakings were not prepared to adopt it, and eventually the report and recommendations of the Court were referred for consideration and report to a Joint Committee of five members from either side of the Council. The committee held several meetings, and after very lengthy discussion, it was unanimously agreed to recommend to the Council that the present rate of wages should be maintained until the first full pay-day in August, and that thereafter there should be reductions from or additions to wages of 1s. per week for each fall or rise of five complete points in the index figure of the cost of living below or above the index figure of 135, such adjustments being made at intervals of three months. This recommendation was adopted by the Council, and there is the hope that the automatic operation of the sliding scale which the agreement establishes will, to a large extent, free the tramway industry from the acute labour disturbances which we have had almost continuously in front of us during the past few years. At the present index figure of 119 the reduction of wages to take effect in August would be 3s. per week.

ROAD MAINTENANCE BURDENS.

Various other matters engaged our attention during the past year. Renewed efforts were made to get some relief from the heavy burdens imposed upon tramway undertakings in respect of road maintenance. It was hoped that the Roads Bill, 1920, would afford the means of doing so, but the Ministry would not accept the amendments we suggested in the Bill, which would have provided for grants to tramway undertakings out of the road fund. A deputation subsequently waited upon the Ministry and represented the matter very strongly, but the only result attained has been a communication from the Department that the Minister of Transport regrets he does not see his way to promote legislation for the purpose

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of relieving tramway authorities from their statutory obligations under Section 28 of the Tramways Act, 1870, or to make any contribution towards the costs referred to out of the road fund.

Other matters that have been occupying our activities, and which have been the subject of special committees are—Depreciation Allowance for Income Tax Purposes, Depreciation of Motor Omnibuses, Overhead Line Material, Lights on Tramcars, Unemployment Insurance, Steel Rails, Through Running Agreements, Cross-road Stay Wires, and the G.P.O. On many of these and other matters the Association has been consulted by the Minister of Transport, which has, I think, resulted in much benefit to the industry, and in all matters we have been able to work in close harmony with our friends of the Municipal Tramways Association. (Applause.)

Mr. E. H. Edwardes formally seconded the adoption of the report, which was agreed to.

The meeting then proceeded to elect six members of the Council in place of those retiring, viz., Messrs. E. H. Edwardes, Harry England, W. Shearer, F. Coutts, A. L. C. Fell, and Alderman R. Mayne, J.P.

On the recommendation of the Council the following were unanimously elected—Messrs. W. Vincent Edwards, R. J. Howley, McGill, F. E. Gripper, J. K. Bruce, and I. Bulfin.

Mr. A. W. Chalmers, A.S.A.A., having been re-elected hon. treasurer, the proceedings of the general meeting terminated.

CONFERENCE PROCEEDINGS.

The thirteenth Annual Conference of the Tramways and Light Railways Association followed the ordinary general meeting reported above. Alderman R. A. Smithson, chairman of Leeds City Tramways Committee, presided as Mr. C. G. Tegetmeier was unfortunately too indisposed to continue in the chair.

The Chairman said they would all join with him in regretting the reason why he took the position of president of the conference. Before Mr. Tegetmeier left, he desired to move a very hearty vote of thanks to him, coupled with the expression of the earnest hope that he would soon recover his good health. They all sympathised with him in his present indisposition and hoped the Chairman of the Council would soon be among then again in his usual vigour.

The motion was carried by acclamation.

TRAMWAY TRACK MAINTENANCE.

The Chairman, in introducing Mr. R. B. Holt, remarked that it was a rather happy coincidence to him personally that he should happen to be in the chair that afternoon, because Mr. Holt served many years in Leeds, where he (the chairman) was one of his supporters. He was glad to think of the position which Mr. Holt had now gained in the tramway world.

Mr. Holt then read his paper on "Tramway Track Maintenance," which was given in full in our issue of July (pages 19-24), and this was followed by a discussion.

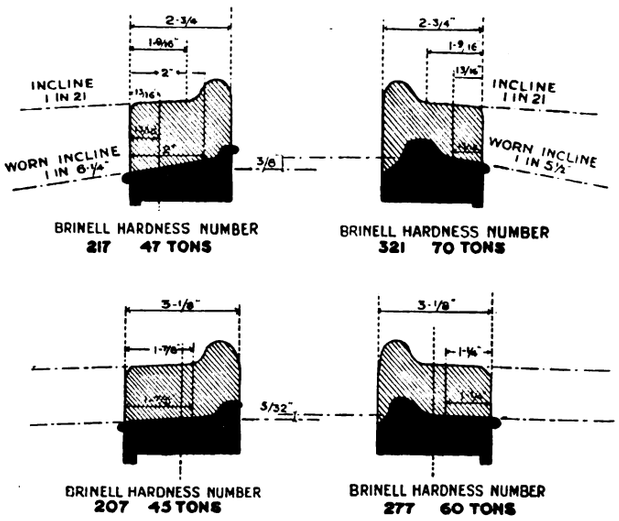
Mr. Arthur Norton (Brown, Bayley's Steel Works, Limited) said that he would first like to congratulate Mr. Holt in having brought this very important subject of Tramway Track Maintenance before the members of the Association in the very interesting paper which they had before them. The post-war, as compared with the pre-war, cost of maintenance had resulted in rails being kept in service for a long period after their effective life was over—that is judged by pre-war standards. The Sandberg "in situ" process, according to the results recorded in the paper, had evidently been instrumental in obtaining a much longer life from the rails than would otherwise have been possible, but the operation was, of necessity, a costly one. He supported Mr. Holt's view with regard to the deepening of the groove in the rail from 1⅛ in. to 1½ in., as by this means they were able considerably to increase the area of the rail head available for wear, and thus extend its life. In this connection Mr. Holt's suggestion for reducing the weight of the new rail by narrowing the foot might also be helped by reducing the thickness of the metal at the bottom of the groove to, say, $\frac{5}{16}$ in., the figure mentioned by the author under the heading of "Groove deepening."

With regard to special track work, there was one point he would like to draw attention to, viz., the depth of the groove, as in certain cases the depth of the groove at the highest point of the crest was specified to be $\frac{5}{8}$ in. whilst the height of the tire flange in the sections generally in use throughout the tramway systems of this country is $\frac{9}{16}$ in. It will thus be realised that the point of contact between the tires and the rails is limited to the tops of the flanges, resulting in that portion of the tire becoming badly worn and detruded, with a considerable reduction in the height of the flange. It is quite conceivable that a source of danger may be introduced through the effect of this reduction in the height of the flange, as the tires would be more prone to mount the rails, especially when curves are being taken at too high a speed. It is not suggested that this ramp effect should be eliminated from special track work, but that the depth of the groove should not be reduced beyond that of the height of the tire flange, viz., $\frac{9}{16}$ in. It may be observed that the practice of reducing the depth of groove has not solved the difficulty of "dishing" at cross-overs, owing to the height of the flange having been worn away.

Referring to Fig. 3 (giving sections of rails laid in 1917, showing present inclined wear), Mr. Holt suggested that the result shown had been brought about by the detrusion effect of the track-brake. In this connection he quoted a remark of Mr. Ireland, "that the area of contact between the tire and the rail had a definite bearing on the subject," and there was no doubt that this view was correct, as it was supported by evidence. It would therefore be of interest to the conference if Mr. Holt would tell them what was the width of the tires that were in service on those rails, and the original inclination of the tire treads. Mr. Holt further quoted Mr. Ireland, viz., "That the worn profile of the rail was brought about chiefly by the shape of the tire." Prior to this question of tire wear receiving the attention that was now being focussed upon it, it was the invariable custom to place tires in service with a tread inclination of 1 in 21, whereas the inclination of the worn rails which even to-day occupy by far the larger percentage of most tracks, varies on different systems according to the width of the tire and loads carried. The result of putting tires into service in this way was that in a short space of time the tires assumed the same angle of inclination as the worn track. On certain systems that fact is now recognised, and new tires, as well as those that come in for overhauling, are being turned to the same angle of inclination as that of the worn rail head.

He wished to draw attention to one very important factor with reference to rail wear that had not been mentioned, viz., the importance of placing on the same axle tires of equal hardness.

In the top pair of tires, shown in the accompanying diagram of



two pairs of wheel tires, it will be noticed that the area of contact in the case of the larger (and harder) wheel was considerably reduced whilst an exactly opposite effect took place in the smaller (and softer) wheel. The coning effect on the harder wheel was also greater, due to the decreased area of contact. The effect on the wear of the rails must be obvious, as the outside edge of the flange of the larger wheel was forced up against the rail check, whilst the inside of the flange of the smaller wheel was forced up against the side of the rail head adjoining the rail groove. Attention was drawn to the difference in the Brinell hardness numbers of the two pairs of tires. In the second pair of tires, although the ultimate difference between the diameters of the tires only amounted to $\frac{5}{16}$ in., it might be mentioned that there was a variation in the diameters of $\frac{1}{8}$ in. after the tires had run 25,000 miles, but were subsequently paired in the lathe. It is also of interest to note that the angle of inclination remained constant.

He was pleased to hear the author's pertinent remarks regarding the standard composition and quality of the steel used in the manufacture of tramway rails. With the ever-increasing tendency to increase the hardness of tires, one could not help thinking that a proportionate increase in the hardness of rails would be of great advantage. An American specification which recently came to his notice gave an analysis as follows—Carbon, 70-85; silicon, ·20; manganese, 60-90. A maximum stress of 50 tons per sq. in. with 8 per cent. elongation was specified. If the higher percentages of

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carbon and manganese specified above had been used in conjunction with each other, a tensile stress of over 60 tons would be reached. Comparing a tram rail with a railway rail, the question of brittleness was not of the same vital importance, as the former was supported throughout its entire length. The question of brittleness, however, could be readily overcome by suitable heat treatment; and in view of the high cost of renewals, a heavier first charge in obtaining really suitable material would be compensated for by the much longer life that would follow. There was no doubt that this very important question raised by Mr. Holt in his paper was worthy of the most serious consideration.

The author's remarks on the sulphur and phosphorous content are very significant. There can be no question that the production of sound ingots, free from pipe, blow holes, segregation, and other defects, is very much more important than a slightly higher percentage content of the above elements. A great deal of experience in this direction was gained during the war, when owing to the impossibility of obtaining low sulphur and phosphorous ores, specifications were widened so as to allow of a sulphur and phosphorous content of ·07 and ·08 per cent., and he had not come across a single failure due to this cause, although thousands of tons of such material had been supplied.

In concluding his remarks, he desired to ask permission to make a statement with regard to tire standardisation. As members were no doubt aware the British Engineering Standards Association have had a tram tire specification and the question of a standard tire and wheel centre under consideration for a considerable period. The tram tire specification would be issued in the course of a few days* and, as the chairman of the Standards Committee pointed out at the general meeting the day before, it was very desirable that the widest publicity should be given to engineers and those interested whenever a particular specification was published, in order that it might be made use of at the earliest possible moment.

He pointed out that whilst the standardisation of the width of profile was a comparatively easy matter, the question of the internal diameter and thickness of the tire was very much more difficult, owing to the variety of sizes of wheel centres employed. The cost of production is very much affected by this want of uniformity, and he therefore took this opportunity of appealing to all users to standardise the size of their wheel centres and tires, especially when ordering new stock, as the process can only be a gradual one.

In the case of railway wagon stock, it took a matter of some twenty years before standardisation was complete, this being effected under the Railway Clearing House. With tramways it might be more difficult, but no doubt members of the Association will give the matter their serious consideration.

Mr. W. Vincent Edwards suggested that to some extent the results obtained were regulated by the electric welding—the arc. They had been doing electric welding at Hastings for a number of years, and although they found they got on quite well and could build up the various joints and ordinary rails, there was a difficulty in getting a satisfactory job. They had tried several classes of electrics but never got anything thoroughly reliable as a permanent job. There might be something in the length of arc in closing the fracture. The difficulty of building up special track work and of using manganese steel, or building up ordinary rails, were points which might have been dealt with. As to rail wheel centres, referred to by Mr. Norton, for years at Hastings they had been altering their wheel centres, but building them up from a smaller to a bigger size. In time they would get all their wheel centres to the biggest size, and that, of course, made a considerable difference in the cost of new tires because it avoided waste of material.

Mr. W. Thom.—Under "Rail Wear" Mr. Holt suggests that the rail groove should be deepened. I would ask him under the circumstances, whether he anticipates having to cut down the rail lip? I mention this, as it may affect track brakes and road traffic if left very high. My experience with regard to the reducing of the width of the flanges is, that the wider you can have them the more satisfactory and permanent the seating can be secured. If the track is laid on cross sleepers, the width of the flange is not so important so long as the rails are bolted down, not spiked.

I find that some of the earlier rails were quite up to the best quality of to-day, and comparison of wear in my opinion, within practical limits, is very easily obtainable by adopting a revision of the rail wear gaugings, which Mr. Holt has himself provided. For instance, if he had reduced rail wear and cars (the latter to car tons), to a common basis, as provided in the paper which I read before the Association at Swansea some years ago, he would find that he has a very satisfactory basis on which to proceed. That is, for comparing rails of similar quality.

Under "Tram Rail Specification" Mr. Holt suggests the revision by the Standards Association. A most desirable thing, but it would be assisting the country and the industry generally if the British makers could be prevailed upon to manufacture the class of rail which is to-day generally favoured. I have never been able to obtain a tender in this country for the class of rail which is accepted in the industry as being the most satisfactory; and as far back as the Swansea meeting, I stated that some undertakings had not even supported their manager's recommendations when a foreign rail had been selected (since generally approved and adopted), but chose and actually ordered in preference, notwithstanding that the British manufacturers would not meet the situation, a British rail costing more and having poorer wearing qualities. The explanation no doubt is that we require a steel that the manufacturers are not now laid out to produce, and the general demand is so small that it is not apparently worth pains to alter their works to produce, unless perhaps the supply could be guaranteed to one manufacturer. Under "Rail Packing," I would ask what success is met with in the use of tar grouting in wet weather?

Mr. W. B. Pickering (Hadfields, Limited) said he had listened to the paper with pleasure, but he had come forward in connection with its criticisms on special track work. He had known Mr. Holt for a number of years and appreciated his work highly. He congratulated the secretary upon having persuaded Mr. Holt to give them such an interesting paper. In most details it was interesting and instructive, but when it came to track work he could not allow the remarks to go unchallenged and he thought it was very necessary that people who read papers should have long memories. Some years ago Mr. Holt produced a book on Permanent Way Construction, and he (the speaker) found himself in a delicate position that afternoon, because that was a very interesting publication, which he had recommended to a number of his personal friends as an orthodox work on permanent way matters; but he would either have to recall his words or differ from Mr. Holt on the present occasion. He had pleasant memories of discussing with Mr. Holt the question of long points v. short points, and when he (Mr. Holt) issued his work on permanent way he expressed the opinion that long points had a considerably longer life, also that they added appreciably to the ease and comfort of travellers as the cars traversed the special work. He did not know what the meaning of the paper was. The author came from the vigorous atmosphere of Yorkshire and he would not like to think that he was at all retrograde in his ideas, but when he recommended the association to use short points and crossings he must cross swords with him and wonder why this retrograde suggestion appeared in his comments. Manufacturers of special work never set themselves up as authorities on trackwork, but they had endeavoured as far as lay in their power to give the permanent way engineer what he regarded as the absolute point of perfection in regard to points, crossings and construction. He thought that Mr. Holt would remember that he was one of the first to put the question to him—"Mr. Pickering, can you supply a 15 ft. point?" He saw that Mr. Holt was asking for something that had never before been attempted, but he replied they would look into it and they did. It was urged that they would not get the amount of wear out of short points and also that they would have much sweeter running through the special work. The result was they supplied the 15 ft. point as desired and now they were asked to go back to the short point. He had always understood that what was wanted for the track and for smoothness of running was a minimum length of tongue of 7 ft. 6 in., so that the suggestion in the paper passed his comprehension. Another point was this: Tramway engineers all knew that the maintenance of the joints was an important factor. If they were going to have a shorter point than 10 ft. 6 in., or 12 ft., then they were going to get back to the old frog point. He did not think any engineer would say he could get a satisfactory joint on a frog point, yet to-day they found Mr. Holt advocating shorter points and crossings, although the illustrations in his work on Tramway Track Construction, without exception, are of long points and crossings. But if they asked him as a manufacturer whether from a practical standpoint shorter points were quite satisfactory, he was bound to tell them they could not get a reliable joint. He was glad, however, to accept from Mr. Holt his appreciative reference to manganese steel, not only for special work, but also for points and crossings, and in this respect his remarks were more satisfactory.

Mr. R. J. Howley said he was pleased to join with other speakers in congratulating Mr. Holt on the paper. They wanted assistance in many problems in connection with rails from those who were responsible for the working and operation of large systems. Mr. Holt's change over from the operating side to the manufacture or business side of the tramway industry perhaps gave him exceptional opportunities for studying rail wear on many systems. Several criticisms were made in the paper in regard to the work of the Standards Committee. He welcomed those criticisms, but to arrive at a standard specification was not the easiest thing in the world. The tendency was for it to be out of date by the time it was issued. They had on the Standards Committee representatives of the manufacturers who kept a close eye on what was being asked for in the way of specification, width of flanges, and many other matters.

* This specification since been issued

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They also had on the committee a number of tramway managers. To some extent the tramway managers' tendency was not to alter the standard. They did not want to have to link up different sections of rails. There was great opposition on the part of some members of the committee to the altering of the standard rails at present in general use. Those standards were going to remain, with the exception that the head of the rail would be altered from a flat sloping tread to a 9 in. radius. The width of head is now the same for all sections. He thought this would be a great improvement. Recently the committee had been working on a new form of rails. The new rail, which was to be No. 8, was a heavy rail of 114 lbs. per lineal yard. It was to have a depth of groove of $1\frac{7}{16}$ in. and flange of 7 in. He hoped that in the future they would have in this country the opportunity to obtain much harder tramway rails than they had had in the past. The L.C.C. tramways had been referred to—they were very big, and their cars carried a very heavy weight. Groove deepening had also been referred to. He had been one of the first to advocate that, and after experience of the process came to the belief that groove deepening was a means of prolonging the life of the rails. Tar macadam was a material which he thought very suitable for use on tramways and in light railways. In some undertakings he knew it had been found to work very well. It was so easy to repair with tar macadam, one could afford to open it out if necessary every few years. At the same time it was quite unsuitable for heavy traffic, and in some cases he knew with heavy traffic the maintenance of tar macadam was excessive.

Mr. Fred Bland said he had known Mr. Holt for 20 years and acknowledged the valuable assistance that Mr. Holt had given to him at different times from his practical track experiences. With regard to the deep grooved rail, Mr. Bland fully agreed with him and had been an advocate of deeper grooves for some years. He was a member of the Engineering Standards Committee and regretted the long time that had been taken to issue new standards. As Mr. Howley had said, there was a great diversity of opinion and hence no results. To-day three sections were proposed, $6\frac{1}{2}$ in., 7 in., and a light track rail $4\frac{3}{4}$ in. deep. These had the ordinary groove, but it was proposed that the radius of the head should be 9 in., instead of 12 in., but the deep groove section was still undecided. He did not know why this continued delay. He thought if the rail makers would issue a section it would soon become a standard. The cost of special track work to-day was heavy, as Mr. Holt had stated, but he might remind them that track work never increased *pro rata* with rails and other materials, and consequently there could not be the same rapid fall. Wages as yet are no less, but production has been reduced, thus adding to the costs, and the fall in hematite, etc., has not yet materially affected manganese steel castings. Until wages and fuel were reduced there could not be much reduction in special work. Mr. Bland endorsed what Mr. Pickering had said in respect to shorter points and thought Mr. Holt must agree that "leg" ends make a firmer job than two rails splayed and bolted on to a lug; otherwise as far as the point itself was concerned, they could get equally as long a life out of a 9 ft. or 10 ft. straight point as they did out of a 12 ft. to 15 ft. curved point. If managers who were relaying would consider that question some saving might be made. With regard to crossings, they were tied to length by their joints, and it was now recognised that short rails were not to be used in junctions, although he had seen splendid results obtained out of short lug crossings. As to lightness, difficulties in casting, excessive contraction, etc., had to be considered, and if the contraction could be reduced to that of cast iron, then Mr. Holt might see a millenium of lightness. Mr. Holt spoke of scarfed crossings. These had always been with them and always would be, but however good they could now be made they would not have the life of solid manganese, even if subjected to the "in situ" treatment, which he presumed Mr. Holt would include under his term "better job," and which he (the speaker) was fully prepared to admit. He was inclined to agree with him as to simplification, but while four manufacturers had their own designs, they could not avoid complications; and they had not yet arrived at the era of a standard type of point, as a cry of collusion would be raised and this he feared blocked that matter, otherwise he was quite prepared to standardise fittings, ordinary and big head, if a common platform could be built, and also to welcome the "Holt Simplex" if he would issue one.

Major J. Caldwell (Alloy Welding Processes, Limited) said his brief remarks would be confined to electric welding. Mr. Holt intimated that since he wrote the paper the method illustrated in Figs. 7 and 8 of the paper had been improved upon. He understood him to say now that there should be a continuous weld along the junction between the fishplate and the weld. He ventured to suggest that there was too much metal shown on the "spots" or "tacks" forming the welded connection between fishplate and rails, and that much better results would be obtained by a single run of welding being placed there instead of what was more or less a mould. In tests carried out by the Manchester tramways department with similar joints welded by the Woods-Gilbert Company, light tacks were substituted for heavy tack welding. The advantage of a light tack was to get fusion between the parts. A strong weld was really obtained by good fusion and good metal in the first layer, no matter how much more metal was subsequently applied. With regard to the reinforcement of hammered joints, it seemed to him as an outsider there were two methods to apply, i.e., either to deposit by means of selected welds soft metal and harden by the "Sorbitic" process, or deposit metal similar in analysis to the rail. In doing the latter it would be necessary that the deposited metal should be analysed.

Mr. C. D. Burnet (Rail Welding Company, Limited) drew attention to the samples of electrically welded tramway rail on the table, and expressed surprise at the remarks of Major Caldwell, who referred to figures of the test of a joint which he claimed as of novel construction, in that it was seam welded along the joints between the fishplates and the rail at top and bottom surfaces, attributing the type of joint and arrangement of the welds to the Manchester Corporation. Mr. Burnet pointed out that whilst the joints illustrated in the paper were of the type made by his company prior to 1914, since that date the type of joint designed and standardised by the Rail Welding Company was of the type referred to by Major Caldwell, the credit for which he had erroneously attributed to Manchester Corporation.

Mr. Burnet explained the samples of rail, which had been resurfaced with 5 per cent. carbon steel on a hollow ground in the head. One-third of the hollow over the whole length was left untouched to show its extent, the remaining two-thirds was filled in with steel, one-half of which was removed by grinding and filing, leaving the finished surface, including the gauge edge, reinstated in the manner of a repaired joint. A slot $\frac{1}{4}$ in. wide was machined longitudinally through the welded metal and into the rail to a depth of $\frac{1}{8}$ in., so that the junction of the added steel and the rail could be examined. Other samples were shown in which the rails resurfaced as above had been sectionised; the shims were kept in correct order by a metal rod which passed through them, enabling them to be turned so as to facilitate the examination of the weld junction transversally. He thought the samples would prove of interest to many engineers. He also pointed out that unless steel welded to the rail contained the requisite amount of carbon in combination, the weld could not be hardened so as to resist the rolling action of the car wheels, as Major Caldwell suggested should be done. If the metal of the welds on the table of the rails was too low in carbon it would be useless and the hollows would soon reappear under traffic conditions.

Mr. W. T. Robson (of the Equipment and Engineering Company) said that on the question of securing a hard deposit, he thought the best way was to sprinkle hardening powder into the weld during the process. It was admitted now that very little carbon could survive the ordeal of passing through the electric arc and a satisfactory and much cheaper solution was to add the carbon by external means. He was not going to sympathise with Mr. Holt in the attack made upon him in regard to special work. He had his book and often read it with great interest, and Mr. Holt was quite able to look after himself. When the book was written, electric welding was practically unknown, but since then it had enabled managers to do their special work economically. There was no doubt that some tramways could not afford to pay for manganese crossings, and Mr. Holt probably had this fact in mind in advocating economy.

Mr. Holt, replying to the discussion, stated that Mr. Norton had raised so many points relating to tires that his remarks almost amounted to a supplementary paper, and in view of the limited time at his disposal he was sure that Mr. Norton would forgive him if he did not attempt to reply to them all. From the tire makers' point of view Mr. Norton had expressed himself clearly, and would appear to have answered many of the points which he himself raised. In regard to wheel flanges riding on the purposely raised grooves in special trackwork, he was entirely at variance with Mr. Norton. Experience had proved that it was the proper thing for the tire flange to carry the load at groove intersections, and the life of crossings was prolonged, and battering prevented by having inclined raised grooves for crossings. He agreed with Mr. Norton in regard to an effort being made to ensure that tires should be of equal hardness, and it was an interesting admission from a tire maker that there had been in the past considerable variations in the hardness of wheel tires. The investigations of the Tramways Corrugation Committee proved that, after a brief period in service, all the wheels of a truck were of different diameters.

Mr. Edwards inquired as to the writer's experience in the use of manganese steel electrodes in connection with the arc welding process, and also whether any economy would not be effected in the use of manganese steel rails for the purpose of making scarfed or "built up" crossings. Mr. Edwards also asked for further information in regard to the writer's statement that the hardness of the deposited metal could be increased by regulating the length of the arc. Mr. Holt stated that he had not had any personal experience

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in connection with the use of manganese steel electrodes, but he understood that satisfactory use had been made of these on several tramways. Mr. Holt said that he did not consider that any economical advantage would be obtained from the use of manganese steel rails for the purpose mentioned by Mr. Edwards, and in regard to regulating the length of the arc he had been assured by an expert, that by shortening the length of the arc, a greater proportion of carbon was carried over into the deposited metal, thus ensuring greater hardness.

Mr. Thom, speaking in regard to Mr. Holt's suggested rail with a deep groove, had pointed out that at a later date trouble might be experienced in connection with the high upstanding check on the worn rail. Mr. Thom also drew attention to his own experience that rails of earlier manufacture gave better wearing results than later rails of the standard quality. Mr. Holt stated that he did not anticipate much trouble from high checks in the provinces; the trouble in regard to high standing checks was one which was peculiar to the metropolis, and a few places in the provinces where traffic density prevented the ordinary street traffic from making use of the track. From his own experience he could say that in most cases the wear due to ordinary street traffic was sufficient to prevent the check from standing up greatly above the rail tread. Mr. Holt agreed with Mr. Thom in regard to the superior wearing properties of earlier rails; this was no doubt due, to some extent, to the more careful regulation of the process of manufacture in those days, and, of course, the fact that a comparatively high price was paid in the early days must not be lost sight of.

Mr. Pickering and Mr. Bland took exception to his (Mr. Holt's) suggestion in regard to the proposed reduction in the size and weight of points and crossings, and Mr. Pickering quoted the opinions which he (Mr. Holt) had expressed in the chapter of his book dealing with special trackwork, and both Mr. Pickering and Mr. Bland insisted upon the necessity for long and heavy castings. Mr. Bland referred to the difficulty experienced in manufacturing manganese castings of light section, in consequence of contraction troubles. Mr. Pickering pointed out that Mr. Holt in his book had also recommended the use of long points, and he also instanced an occasion when he (Mr. Holt) had prevailed upon him to manufacture, for him, points 15 ft. in length. Mr. Holt, in reply, complimented Messrs. Bland and Pickering upon the spirited criticism which they had made in regard to his suggested modification in the designs of special track work.

Mr. Pickering had referred to suggestions made in his (Mr. Holt's) book in regard to long points and crossings, and he would say in reply that on principle he was not prepared to deviate from what he had set forth in the book in question, but it must be remembered that conditions had changed. Tramways had little, or no, money, and if manufacturers were going to sell points and crossings it was essential that they should be made cheaper and lighter. It appeared to him that unless the cost of production went down tramways would be unable to carry on. He agreed with Mr. Pickering that people who wrote books should have long memories, and for Mr. Pickering's benefit he would suggest that it was equally desirable that those who read books should read them carefully, in order that they may quote from them correctly. He believed that in the chapter referred to by Mr. Pickering reference was made to the fact that uncomfortable travelling resulted from the use of lengthy points of easy radius in consequence of the motormen running through such points at high speeds; as a result of this the extremely long points referred to by Mr. Pickering were superseded by shorter points of sharper radius.

Mr. Holt wished to remind Mr. Bland that he himself had often stated that in his opinion the best tramway point which had ever been turned out was one of a simple design which did not exceed 10 ft. in length; in fact, Mr. Holt had frequently challenged Mr. Bland in the past to reproduce that particular point, but as far as he was aware he had never done so. It must be clearly understood that he was not criticising the design of special work in general. The criticism arose out of conditions obtaining to-day. Tramway undertakings were in a parlous state, and it was a fact that several important tramways were, at the present time manufacturing their own junctions, and were finding that they could make an excellent job by means of the arc and autogeneous welding processes.

In reply to Major Caldwell, Mr. Holt stated that it was not possible to harden deposited soft metal to any appreciable extent by any exothermic process, and if it was desired subsequently to increase the hardness of deposited metal, it was necessary that this metal should contain a considerable proportion of carbon.

With reference to Mr. Howley's observations that it was not the intention of the Standards Association to deepen the grooves of the modified sections numbers 3 and 4, Mr. Holt said that this was a matter for regret, and he hoped that the Standards Association would give the matter further consideration, as there was not the slightest doubt that deeper grooves were necessary, and as he had observed in the paper itself, if the Standards Committee did not settle these matters they had a way of settling themselves, and as a rule the desirable elements of standardisation were lost.

The Chairman said he was sure, after the interesting paper and the lively discussion it had produced, that they would desire to pass a hearty vote of thanks to Mr. Holt for the time and trouble he had taken in the preparation of the paper. Various points had been raised; there had been some criticism and some difference of opinion on various points. He thought that would all be for the good of tramway enterprise in the future. He was not a technical tramway expert, but was one responsible for commercial results; and he thought that out of the differences of opinion expressed it might be possible hereafter to get tramway material at a somewhat more reasonable rate, so as to enable tramway undertakings to have a little left at the end of the year. He had great pleasure in asking the Conference to show their appreciation of Mr. Holt's contribution to the literature of the Association and accord him a hearty vote of thanks.

The motion was carried by acclamation.

ELECTRIC ARC WELDING.

Mr. E. H. Edwardes here took the chair and invited discussion of Mr. Sayer's paper on "Electric Arc Welding," the full text of which will be found in THE TRAMWAY AND RAILWAY WORLD of July.

Mr. R. J. Howley said there was no doubt that electric welding would play an important part in tramway work in the future. He would like to know what was the effect of phosphorus and sulphur in the rail when arc welding was applied. He had read that an increase of these elements in the composition of the metal would tend to make a good weld more difficult and this was important in considering specifications. He would also like to have some information as to the effect of rust. Was it necessary when welding a fishplate to clean the plates completely of rust? Would the effect of the high temperature be such as to drive out the oxide and combine it with the silicon and so have no deleterious effect upon the weld? Would it be possible to harden the welded metal applied to the tread of the rail? He was glad to hear Mr. Sayers say that manganese steel could now be properly welded, because only recently he had read a statement by Sir Robert Hadfield that he had not yet found a satisfactory process for doing this. It appeared from his (the speaker's) experience that arc welding would give much better results than oxy-acetylene. That might be due to a better distribution of the heat in the former process. It seemed that the difficulty in all welding was not so much the making of a good joint as avoiding a detrimental effect on the surrounding metal. Much discussion was going on with regard to the voltage of the arc which was used. He believed some of the best welds were made with a pressure of 25 volts at the arc, but it would be useful to hear more on that point.

Mr. Arthur Norton (Brown, Bayley's Steel Works, Limited) remarked that Mr. Sayers had mentioned that rustless and stainless steel could now be welded. He wished to state that only last week the inventor of rustless and stainless steel—Mr. Harry Brearley—stated emphatically to him that this steel would not weld. His own firm were very large manufacturers of that steel and it had not been found possible to effect a satisfactory weld. The steel contained a very high chromium content, the melting temperature of which was extremely high, and as a consequence the steel would not weld.

Major Caldwell said he had been struck with one of the best features of the paper. Mr. Sayers commenced by mentioning some failures in the use of electric welding and explained the reasons for the difficulties experienced. The question of electrodes was too big a subject for this discussion and really required a separate paper to do it justice. It might be mentioned, however, that the cost of electrodes was a very small proportion of the total cost of welded jobs, so that it was economical to use only the best. In some work the cost of electrodes would be £2 on a job worth £200 and in others £5 on a job worth between £200 and £300. The best electrodes could be classed under two heads—the one most easily applied and the other the electrode which gave the best results. The operator would prefer the former and the tramway expert and responsible party the latter. For general work a combination of the two was desirable. As to the special work described in the paper, he thought cast-iron welding was a most wonderful development, comprising as it did the manufacture of cast iron from a flux-covered electrode with core of steel, which is converted into cast iron in process of welding. When this method was shown to metallurgists, they could not credit it, because many experiments had been made in the past—but without success—to endeavour to produce synthetical cast iron on a large scale. There was no doubt that synthetic cast iron could be produced commercially in the weld arc, although it had not yet become possible to manufacture large quantities of synthetic cast iron commercially. With regard to manganese steel, there was no difficulty whatever in depositing the desired percentage of manganese, but there was some difficulty in securing satisfactory

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completion of the job. Before depositing the metal they must get considerable heat into the shape and preheating was sometimes advisable. With reference to the masts, one of which was shown in the illustration, 700 had already been delivered and another 1,000 were in the process of manufacture. The firm manufacturing these masts were also manufacturing signal standards for the Belgian State Railways. It was a matter of interest to know what was being done by other railway engineers, and he quoted from the May report of the Rolling Stock Department of the Belgian State Railways. They were recommending the use of electric arc welding for the repair of the permanent way and the adoption of microscopical tests. He could not too strongly advise the adoption of microscopical testing in order that welders might know the quality of work turned out by them. Copies of the translated report of the Belgian State Railways could be obtained on application to the secretary.

Remarks were made in the paper as to welded wheels. It was stated that these had been fairly satisfactory, but Mr. Sayers said there had been some failures. He wanted to take that opportunity of stating that there had been no failures and these welded wheels had been entirely satisfactory, both for pneumatic tires and solid tires. The maintenance cost of these wheels was very low and they were 50 per cent. lighter than cast-steel wheels for similar service. Such wheels had been supplied for chars-a-bancs and commercial vehicles, also to the London General Omnibus Company. Mr. Sayers would like to know that the first set of wheels supplied to that company were subjected to the severest possible tests to make them break down, and although they did not break them down with the tests, flaws developed in the rear wheels after some months' service. The wheels were taken off, rewelded and returned to duty. Mr. George Shave, operating manager and general engineer of the company, had stated that the mileage run by the first set of wheels on July 7 was—rear wheels 6,340 miles, front wheels 6,455 miles, after some six months' work, and the other remaining 11 sets were still in service. He would not say any more, although there were many points about electric welding which could be dealt with at great length.

Mr. W. Thom (general manager and engineer, Potteries Electric Traction Company) said he had listened to Mr. Sayers' paper with great interest. It was a particularly useful one at the present time, when repairs cost so much and there was so much that could be gained and saved. He had been using an electric welding plant for upwards of 12 years and he did not think any undertaking of a reasonable size was really complete without one. He supported Mr. Sayers that in welding steel castings they could be made specially strong by adding a little to the thickness of the castings, within reasonable limits. The great saving, of course, was in the fact that they could sometimes weld the part without dismantling and that was a saving not only in time but in cost. A very great deal could be done with bare steel if confined to steel work, both wrought and cast, and when special steels were involved covered electrodes of special composition gave excellent results. For instance, they had been able to make a capital weld on manganese steel points. He had had experience of an exactly similar case of boiler furnaces grooving and repair to that mentioned by Mr. Sayers, but attended with more satisfactory results. The failure took place in the furnace flange attached to the boiler front plate (and was of rather an extensive character, being more than half way round the flanges of two furnaces); the flaws were cut out and made up and lasted for upwards of nine years, when they again started giving out. This was considered a satisfactory life for the particular job. The flaws had again been cut out and rewelded, the work standing up quite well, the boiler having been in use for upwards of six months since the last repair. The boiler flues had been about nine years in service when they first failed. A very useful repair was the replacement of badly corroded tramway street standard tops. The process was to cut off at the first section and replace with a new piece, the latter being welded to the pole and an inner sleeve. As regarded welding plant, it was the tendency at one time to adopt machines where necessary, equal to the work of two welders, but experienced users and manufacturers now recommend single machines, as the losses by short circuiting are much reduced. He would ask Mr. Sayers what surface of weld was applied in cases of roof spans? He meant compared with the sectional area of the materials of which the spans were constructed.

Mr. F. M. Allan (G. D. Peters and Company) said that it had been his experience during the last ten years, more particularly in America, to have a great deal to do with electric welding. He thought the Conference might be interested to know what was being done out there. The tramway engineer in the United States had a great deal of faith in electric welding, both from the point of view of upkeep and economy. In large cities like New York, Detroit and Cleveland, all rails and fishplates are welded. It seemed to him that they looked upon it as part of the repair shop plant. In many cases they were doing a very large amount of repair and track work. As to covered and bare wire electrodes, Mr. Sayers was perfectly correct in saying that in America they used bare wires, and he thought, personally, that bare wire deserved just as much credit up to date as any coated wire. In the particular system of welding which he had in mind, a control panel was the means of giving a very low welding voltage, and with fixed amperage and voltage the operator was bound to deposit homogeneous metal owing to the shortness of the arc, which he thought was the secret of successful welding. He would further state that the use of bare electrodes in this and other countries was becoming much more prevalent, and many of the leading railway companies now used them extensively. He could confirm what Mr. Sayers had said about manganese steel, and he did not think there would be any trouble in that direction; but he did not agree with him as to the merits of coated electrodes. The paper furnished constructive criticism on the whole subject.

The Chairman (E. H. Edwardes, general manager and engineer, Lancashire United Tramways), in closing the discussion, said he had practised electric welding on his tramways for 10 or 11 years and it was a mystery to him how in these hard times any tramway manager could get on without electric welding. Electrical welding had been adopted in every department of their system, and there was hardly any part of tramway equipment that could not be electrically welded with more or less success. But it was quite extraordinary to visit a number of tramway undertakings and find that they had not yet got any sort of plant. His old friend Mr. Thom started him welding 12 years ago, and he might say he started half a dozen systems up in the north himself. He was not quite convinced about covered electrodes. They all knew they were very much more expensive. One speaker remarked expense was nothing, yet when they had to pay before the war something like £16 a ton for bare electrodes and for covered electrodes anything up to £150, and when one had four welding sets going continuously he thought the expense was something. He had tried half a dozen different sorts of covered electrodes. Let the manufacturers try themselves. He found that as far as rail welding went they gave no better results. The experts had been down to his place and had said that they could not better what he was doing. At present, until they found something better, he would continue to use the plain electrode. He used covered electrodes in special cases such as manganese steel.

Mr. Sayers said he would only reply to a few of the many points raised. Mr. Howley questioned the effect of the phosphorus and sulphur in the rails. He thought that as long as the proportions of phosphorus and sulphur did not exceed those found in an ordinary rail steel, there was no effect on the weld. Analysis of the weld metal would generally show that the phosphorus and sulphur in the weld metal were a little lower than they were in the electrode, and in the metal close to the weld they also seemed to be burnt out to some extent, i.e., in the stock metal which had been melted by the arc. Of course, a very large proportion of phosphorus and sulphur would be injurious. As to rust, it was desirable to brush the surfaces to be united; it was not necessary to polish them. The flux would flow off small amounts of oxide. Evidence had been given that manganese steel could be satisfactorily welded, and he was glad to hear Mr. Howley and other speakers agree that arc welding is better than acetylene welding. The latter had its field, which arc welding could not touch, but outside that field, the arc was best. As to voltage, at the arc it should be the lowest voltage which would maintain the arc. With machine arc welding where the unsteadiness of the human hand did not come in, he had seen volt meters stick at 18 volts for minutes on end and very good work was done. It was difficult to get that with hand welding. Generally speaking, from 20 to 25 volts was sufficient and should not be exceeded. One of the great points in welding was to keep the voltage low and the arc short. Then it was said that stainless steel could not be welded. He thought Mr. Norton was wrong.

Mr. Norton.—I did not deny it, but I was so informed.

Mr. Sayers said he might be wrong, but he had been told that it was being done and he was not prepared to say it was not done. Major Caldwell spoke of the steel wheels, but he admitted that some cracks developed on some of the welded wheels, which the speaker believed to be the cases already alluded to. He thought that he had shown in the paper that he considered the wheels satisfactory as a whole.

Major Caldwell remarked that the cracks he referred to did not take place at the welds.

Mr. Sayers said he had not said they did, and as Major Caldwell had been able to give the whole of the facts, he hoped they would be satisfactory to his hearers as well as to himself. Mr. Thom knew as much about tramways as anyone, and he was very glad he confirmed what he had said generally as to the usefulness of the process. He had succeeded in welding manganese steel points and new top sections to trolley standards. That was useful. As to the reference to separate machines for each welder, he was afraid if they had continuous current a separate machine for each welder was the only satisfactory method. But if they were using alternating current it was possible to supply a number of welders from a single transformer,

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and without one mutual interference. So far as bare wires and covered electrodes were concerned, he did not think it was quite correct to say that all the great railway companies were using bare electrodes. He knew some were using covered electrodes and they were finding them satisfactory. That flux-coated electrodes permitted the use of high voltage came to him as a novelty. They did not want high voltages. One of the advantages of a flux-coated electrode was that the man could better see the length of the arc he was using, because of the sharp boundary line of the covering. The chairman was another speaker with a great experience of arc welding, and he had said he did not know how a tramway could be run without it. He thought Mr. Edwardes was quite right. He also spoke of covered electrodes, and admitted that with manganese steel, covered electrodes were the right thing. That was the general experience, he thought, and if they had got special steels they must have special electrodes and a flux to suit. If the work being done required only weld metal, consisting virtually of pure iron, then the bare wire would give satisfactory results. To the question as to the hardening of weld metal he had no answer. If the deposited metal is not of the right hardness, they could not do anything afterwards to alter it, so far as he knew.

A hearty vote of thanks to Mr. Sayers for his paper closed the proceedings.

THE ANNUAL DINNER.

In the evening the annual dinner was held at the Trocadero Restaurant, Piccadilly Circus, W. The president, the Hon. Sir Arthur Stanley, G.B.E., C.B., M.V.O., occupied the chair, and there was a large attendance of members, including the following—

R. Ainsworth.
C. V. Allen.
W. J. Allen.
F. C. Armstrong.
S. E. Baker.
Geo. Balfour, M.P.
A. L. Barber.
E. S. Barralet.
J. Beckett.
W. W. Beaumont.
A. L. Beatty.
E. Benedict.
F. Bland.
W. Bishop.
E. Bond.
E. M. C. Boys.
F. Bourne.
A. J. Boyd.
W. T. Bower.
C. D. Braidwood.
J. K. Bruce.
P. Buckley.
J. L. Burton.
F. Burfoot.
J. Browning.
C. L. Buckley.
J. M. Calder.
M. Callahan.
J. A. Campbell.
J. M. Cater.
R. Chisnall.
A. Clements.
W. W. Clark.
J. H. Colyer.
Fred Coutts.
A. G. Conway.
C. T. Collins.
J. Crawley.
H. Cubley.
C. E. Cumberland.
R. G. Cunliffe.
A. E. Danvers.
A. de Turckheim.
Sir James Devonshire, K.B.E.
R. F. Dixon.
J. Dobson.
S. Dudman.
W. Elliott.
E. H. Edwardes.
W. V. Edwards.
J. W. Falkingham.
E. Fleming.
H. J. Ferguson.
J. Fry.
P. B. Goldsworthy.
F. Griffiths.
R. Gurney.
J. B. Hamilton, C.B.E.
S. Hann.
C. E. Hawkins.
H. Hawley.
W. H. Hawley.
L. B. Hewitt.
F. Hewer.
W. T. Hill.
E. Hoadley.
A. R. Hoare.
H. Holliday.
G. W. Holford.
R. B. Holt.
R. J. Howley, C.B.E.
W. H. Hughes.
P. M. Hunt.
A. J. Hollington.
A. C. Ingram.
F. Irvine.
A. H. Jackson.
C. J. Jewell.
A. Johnson.
J. J. Kelly.
J. J. E. Kennedy.
A. Kennedy.
F. W. Ketley.
B. Kingsford.
C. Y. Knight.
F. Laurance.
E. H. Lean.
Major A. E. Levin.
S. Loosen.
W. L. Lorkin.
H. Lotery.
E. Manley
A. V. Mason.
G. A. May.
Ald. R. Mayne.
H. F. Maynard.
H. Morgan.
W. V. Morland.
J. B. Moss.
F. Moss.
E. M. Munro.
L. M. Myers.
A. R. McCullum.
J. McLeod.
A. Norton.
S. E. Osborn.
A. W. C. Parsons.
W. B. Pickering.
R. H. Piggford.
Ashley Pope.
W. T. Robson.
G. A. Roberts.
L. M. Rowe.
F. E. Saunders.
H. M. Sayers.
E. E. Sharpe.
S. F. Shears.
W. H. Shaw.
Geo. Shave.
H. Scholey.
A. E. Shorter.
E. Sleight.
Ald. R. A. Smithson.
E. R. Soames.
H. K. Spark.
C. D. Stanley.
M. O. Spicknall.
R. E. Skipworth.
T. E. Taylor.
A. W. J. Talbot.
C. R. Tattam.
C. G. Tegetmeier.
W. Thom.
J. B. Tippetts.
A. Toms.
H. E. Townell.
H. J. Troughton.
W. C. Ullman.
A. Vickers.
W. W. Wakley.
G. Walker.
A. H. Walton.
F. A. Warlow.
V. Watlington.
A. M. Willcox.
I. E. Winslow.
A. W. Woodyatt.
A. G. Whyte.
U. Willam.

After the customary loyal toasts had been honoured, "The Tramways and Light Railways Association" was proposed by Alderman R. A. SMITHSON (a vice-president and chairman of Leeds City Tramways Committee), in the absence of Sir Henry Maybury, who was prevented from attending on account of Government business. In prefacing his remarks, Alderman Smithson said that in proposing the toast he would disassociate himself from the Tramways and Light Railways Association and ask the company to regard him as a member of the Municipal Tramways Association, and as chairman of a municipal tramways undertaking. Going back 20 odd years when both these associations were in their infancy, he recalled a great meeting of tramwaymen held at Glasgow, at which Mr. John Young presided. He (Alderman Smithson) remembered making some remarks there very strongly advocating the union of the two associations into one big body. He rather flattered himself that he nearly "did the trick," and that such an amalgamation seemed very likely. A prominent member of the Tramways and Light Railways Association, in responding to his speech did not, however, welcome the idea in anything like sympathetic terms, and the projected fusion did not come off. Alderman Smithson added that he was a very strong advocate of this union in those days and for many years afterwards, though looking back, he was not sure but that the best thing happened. The enormous growth of the tramways industry throughout the length and breadth of the land had been such as to justify the separate existence of two associations. He was glad to notice through the later years that whatever little animosities there might have been between the company-owned tramways and the municipally-owned undertakings had almost entirely disappeared, and that the two associations were working side by side in absolute harmony, both aiming at the same great goal—the success of the tramways industry, however operated. The Tramways and Light Railways Association had grown from an organisation of small beginnings into an association of great influence. He was glad to know that its influence, in conjunction with that of its sister association, had had its effect on Parliament on many occasions during recent years, and had been a great factor for good. There was no doubt it was essential tramway authorities should unite, for there was a fear of the tramway industry being crushed out of existence. He was glad to remember that only recently an agreement had been come to between the employers and the employees in the industry, and that the foundations for it were laid in Leeds—the city which he had the honour to represent. Alderman Smithson then referred sympathetically to the absence of the chairman of the Council (Mr. C. G. Tegetmeier), who was obliged to retire early from the afternoon meeting owing to indisposition. It was their earnest wish that he would quickly recover. (Hear, hear.) In coupling with the toast the name of Sir Arthur Stanley, the speaker recalled the time when the president came to the help of "this very frail infant association" and took an enthusiastic part in bringing it up to a vigorous manhood. He hoped Sir Arthur would be president for many years to come, and he could feel justly proud of what the association had achieved under his auspices. "Every one of us is proud indeed of our president, and trust he will long be with us," Alderman Smithson concluded, amid applause.

The PRESIDENT, in responding, regretted the absence of Sir Henry Maybury and referred to their appreciation of the way in which he, as the representative of the Ministry of Transport, had helped them and tried to do his best in the interests of tramwaymen. After alluding to the cordial and harmonious terms under which they were working with the sister association, Sir Arthur remarked that perhaps their failure to amalgamate was after all for the best. The two bodies had gone on side by side, growing in strength, and now that they were working together with a united front it was probably better than if they had joined. He alluded appreciatively to the two papers read that afternoon and added that next year the congress would get into post-war condition and instead of a one-day meeting, would have two or three days at Bournemouth. The president expressed his regret at the absence of Mr. Tegetmeier, and in acknowledging the energy and willingness with which he devoted himself to his office, mentioned that Mr. Tegetmeier had never missed a meeting of the Council during his chairmanship. Quoting the Prime Minister's allusion to "some light at the end of the tunnel," as regarded prospects of better times, Sir Arthur Stanley said that in the tramways industry they did see some brighter days in store. He congratulated all who took part in the recent wage settlement, which they hoped would mean peace in the industry for many years to come. (Applause.)

Mr. W. W. BEAUMONT, in proposing the health of the president, pointed out that since he came to its assistance, the association had gone forward by leaps and bounds to the position it held to-day, and also eulogised his work on behalf of road locomotion generally.

The PRESIDENT, replying, proposed the health of the secretary, and said it was mainly due to Mr. de Turckheim that the association had held together strongly during the past trying year, in its negotiations with the men and with the Government departments.

The secretary briefly responded.

During the evening Mr. Harry Cubley entertained "at the piano."

LEEDS TO LIVERPOOL BY ROAD.

It is now possible to travel from Leeds to Liverpool, a distance of over 90 miles, by tramcar and motor omnibus. This has been made practicable as the result of concessions by the West Riding and Lancashire County Councils to the Todmorden Corporation. In the past the route was not wholly connected, and it was necessary to walk from Hebden Bridge to Summit, where the Rochdale car service begins. To obviate this, the Todmorden Corporation have obtained permission from the West Riding County Council to run their motor omnibuses beyond the limits of the borough area to Mytholm, near Hebden Bridge, and the Lancashire County Council have given consent for the vehicles to run from there to Summit. The whole route is therefore linked up.

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PROGRESS OF L.C.C. TRAMWAYS.

GENERAL MANAGER'S REPORT.

The recently issued summary of the accounts of the London County Council Tramways for the year ended March 31, 1921, is accompanied by a brief memorandum from the general manager, Mr. A. L. C. Fell, dealing with the working of the undertaking. Mr. Fell points out that the situation with regard to the supply of stores and materials did not undergo any substantial improvement during the year. Prices continued to advance, principally on account of increases in wages, railway rates, the price of coal, etc. Although the introduction of foreign competition and other considerations have tended to reduce prices in certain directions, this advantage has been largely neutralised by the increased cost of labour and transport. Until industrial conditions become more stabilised, the question of supplies is likely to be a source of anxiety.

The Conciliation Boards established in 1909 for dealing with questions of wages and conditions of labour in the tramways department were abolished in June 1920. The questions referred to, so far as the transport workers are concerned, now come before the National Joint Industrial Council for the tramway industry, and as regards the electrical workers, before the London District Council (Area No. 10) of the Joint Industrial Council for the electricity supply industry.

Considerable improvements were made in the car services during the year, consequent upon the additional number and improved conditions of the cars available. The section of the Lee Green to Eltham tramway was opened for public traffic on November 20, 1920, and on March 22, 1921, the section from Lyme Farm and Eltham High Street was opened for traffic. All through running services with the Metropolitan Electric Tramways, Limited, discontinued owing to war conditions, were restored, and on June 2, 1920, additional through running was commenced by an extension of the Liverpool Street and Stamford Hill service to Edmonton.

The issue of through tickets between all tramcars and omnibuses running to and from Victoria was commenced on February 16, 1921. The points on omnibus routes to which passengers by tramcar are able to book are as follows—Sloane Square, Westminster (Bridge Street), Bond Street (Piccadilly), and Mount Street (Park Lane).

Two complete changes in the scale of fares were made during the year, viz., in April and September, 1920. The new scale of fares which came into operation in September last was authorised by the Minister of Transport in an interim order dated August 17, 1920, issued under the Tramways (Temporary Increase of Charges) Act, 1920, and renewed in February, 1921, for a period of three months.

In accordance with the arrangements approved by the Council on March 30, 1920, an experiment with the cheap midday fare was brought into operation, in the case of the southern tramways on April 19, 1920, and in the case of northern tramways on May 10, 1920. A maximum fare of 2d. has been charged on the Council's tramways for a continuous journey on one car on weekdays from Monday to Friday (inclusive), excepting all national holidays, the maximum fare being in operation on all cars timed to arrive at London termini between 10.30 a.m. and 4.30 p.m., and on all cars leaving London termini between 10 a.m. and 4 p.m. On June 22, 1920, revised fares came into operation on the Metropolitan Electric Tramways, necessitating further alterations to the scale of fares on all through services operated jointly by the Council and the company.

During the year approximately half a million tramway maps and guides were distributed, and supplies were sent to libraries and other public institutions, as well as trading establishments. Copies of the map were also inserted in a number of guide books and catalogues. About one thousand of these maps are now exhibited in public places in London. The Council's tramway advertisements have appeared regularly in certain morning, evening, and weekly newspapers, and posters giving information of use to the public have been displayed at tramway shelters and in other suitable positions.

The load at Greenwich power-station increased considerably during the year as the car services were extended, the maximum load being 38,500 KW., as compared with 37,200 KW. in the previous year. During the first ten months of the year the quality of fuel obtainable was little better than that of the previous year. It was irregular in quantity and quality, and unsuitable for the stokers. The average cost per ton of coal was 44s. 7d., or 2s. 8d. per ton higher than in the preceding year. Owing to the cost of coke, its use was comparatively small, and the amount used was only 5·76 per cent. of the total fuel used, as compared with 14·2 per cent. in the previous year. The cost of the disposal of ashes was 4s. 9d. per cubic yard, as compared with 1s. 7½d. in July, 1919. The installation of a fourth 8,000 KW. turbine set to replace the last of the four original reciprocating sets erected, and three large new boilers to replace the six smaller boilers at the north-east end of the station, was authorised. The Council also sanctioned the reconstruction of the Holborn and the Streatham sub-stations, involving the installation of new switchgear, and seven 1,000 KW. rotary converters in place of the existing sets. Additional high tension feeders to the Shoreditch and Tooting sub-stations and the rearrangement of other high tension feeders were also authorised.

The number of electric cars in service at March 31, 1921, was 1,373, and 119 trailers, making an increase of 60 electric cars as compared with the corresponding date twelve months before. Tenders were invited and contracts let for the supply of 125 new cars of the Class E1 type. Various improvements have been effected in the design of the details of the cars, and experiments are continuously made with the view to increasing the efficiency of the cars and equipment.

Although the Council offered a prize of £1,000 for an improved design of tramcar no award was made, as the designs submitted were considered to offer nothing really new and at the same time practical. A number of additional motor vehicles was obtained, and the transport work of the department was in consequence considerably improved.

Considerable progress was made in overcoming the arrears of repairs due to the war. The number of road gangs was increased by 20 per cent., with the result that the condition of the tracks generally showed an improvement. In addition to a number of junctions, crossings, cross-overs, etc., 26 miles of track were renewed. Electric welding was more extensively employed for the renovation of rails and castings, and this, combined with additional facilities for grinding joints and crossings, resulted in an improvement in the life of the rails and smoother running. For the distribution of materials to the roadwork gangs, seven additional steam motor lorries were obtained.

RAILLESS TRACTION IN AMERICA.

The Virginia Railway and Power Company, of Richmond, Virginia, is a pioneer in the installation of railless trolley lines in America, and it is an interesting coincidence that the same city witnessed in 1888 the opening of the first modern electric street railway. Particulars of the railless installation, as given in the *Electric Railway Journal*, of New York, show that the "trollibuses" have been built by the Atlas Truck Company, and have bodies somewhat similar to the standard safety car which has become so popular in America. Mr. C. B. Buchanan, the general manager of the railway company, who has been largely responsible for the design of the vehicles, states that with a slight adaptation they can be run over a grounded track return circuit. The solid rubber tires with which the steel flange rims of the wheels are fitted would have to be removed, and a flat sliding contact shoe on the trolley wheel would be used to take the current from the overhead trolley wire. Ordinarily the vehicle will run on a track return circuit, even though equipped with rubber tires, by having a so-called adapter attached to the collector for connection with the standard overhead wire, and a shoe which fits into the rail groove to provide the necessary ground connection. On routes where there are no rails to complete the circuit, two overhead wires are used to form an entire metallic circuit. The wires are strung in parallel, 14 in. apart, and are doubly insulated with porcelain ring insulators.

The chassis has an over-all length of 22 ft. 9 in., with a frame of steel channels which weigh about 13 lb. per foot. The front axle is an I beam section, and carries 50 per cent. of the weight of the vehicle. At the rear end a worm-geared drive is connected directly by universal joints to the propeller shaft.

Power is provided by a standard G.E.258 ball-bearing ventilated railway motor, the type largely used for driving safety cars. The motor is so supported between the side frames that it can be directly connected to the propeller shaft by a universal joint in much the same way as the geared driving shaft of a motor car is connected. Control is provided by a R.Z. type of control by pressing down on a pedal lever which is mounted similarly to the clutch foot pedal. The driver can actuate the controller point by point by alternately pressing on and releasing the foot pedal, and he must keep his foot on this pedal at all times when running, as otherwise a dead man's release will shut off the power supply.

The seating capacity of the vehicle is 30, or, with 15 standing passengers, 45. At 150 lb. each for the passengers and driver, the living load is 6,900 lb.

REORGANISATION OF THE BERLIN TRAMWAYS.—When including in our issue of June 16 a translation of the interesting article on the "Reorganisation of the Berlin Tramways," which appeared in the *Elektrische Kraftbetriebe und Bahnen*, we inadvertently omitted to mention that the article was written by Dr. Von Leonhard Adler, city traffic engineer of Berlin, who is also ex-officio chairman of the Administrative Council of the Amalgamated Berlin Tramways.

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TWENTY-FIVE YEARS OF TRAMWAY MANAGEMENT.

PRESENTATION TO MR. T. R. WHITEHEAD.

Mr. T. R. Whitehead, who has completed 25 years as general manager and engineer of Coventry tramways, has been honoured with a presentation by the staff and employees. Mr. Whitehead was appointed manager and engineer of Coventry Electric Tramways in 1896, and the system was acquired by the Corporation in 1912. The presentation took place in the new car shed at Priestey's Bridge Depot on July 17. There was a large attendance of staff and employees, who took advantage of the occasion to testify to Mr. Whitehead's popularity and ability.

Mr. W. H. Milnes, the then assistant engineer, presided and said they had met to ask Mr. Whitehead to accept some silver pieces, subscribed for by the employees of the department as a token of the respect and esteem in which he was held. Mrs. Whitehead they would ask to accept a silver centre vase as a permanent reminder to her that they appreciated the help and practical sympathy which they had received from her at all times. When Mr. Whitehead came to Coventry 25 years last May, electric tramways were little known in this country, Coventry being one of the first three or four towns in the kingdom to adopt them.

Mr. T. Waite handed to Mr. Whitehead a silver fruit stand and silver coffee pot, the former engraved as follows—"Presented to T. R. Whitehead, Esq., by the staff and employees of the Coventry Corporation Tramways as a mark of esteem on the occasion of his having completed on May 6, 1921, 25 years' service as General Manager and Engineer." Mr. T. Whitemoss asked Mrs. Whitehead to receive a silver table stand, also suitably inscribed. A number of employees spoke of the high regard in which their manager is held.

Mr. Whitehead, in acknowledging the gifts, spoke of the many changes and considerable developments which had taken place in the industrial position of Coventry since he became manager and engineer of the tramways undertaking. Coventry was amongst the first of the tramways in this country to be operated on the overhead electric system, and had been in operation only five months at the date of his appointment. A transport system bore a very considerable influence on the industrial life and prosperity of a city, and the tramways undertaking in Coventry had no doubt in some small measure contributed to the city's industrial development. The length of line open in 1896, the year he came to Coventry, was 5¾ miles; there were ten cars and the number of passengers carried during that year was 1,272,829. At the present time the length of route was 13¾ miles, the number of vehicles owned by the department, 53 tramcars and 11 motor omnibuses. No less than 13,286,017 passengers were carried during the past year. The number of regular employees had increased from 44 in 1896 to over 300 at the present time. From a transport point of view the department had had many difficulties to contend with, what with the narrow streets in the central area and in normal times, the heavy rushes of traffic at certain periods of the day. After paying a tribute to the faithful services of all grades of employees, Mr. Whitehead said he felt firmly convinced there was a bright future for Coventry and its tramway undertaking, and what was needed of them all was to use the means at their disposal to their fullest extent to furnish the best service possible required by the community. He also expressed the thanks of his wife for the gift, which she would always treasure.

A RETROSPECT.

Mr. Thomas Ross Whitehead, M.I.Mech.E., served an apprenticeship with Messrs. Hudswell, Clarke and Company, locomotive engineers, Leeds. Subsequently he was engaged in marine engineering for a short time, and from 1893 to 1894 was chief engineer of the Roundhay electric tramways, Leeds. Mr. Whitehead was chief of the staff during the construction and operation of the first section of the Bristol Tramways, 1895, and was appointed manager and engineer of the Coventry Electric Tramways in 1896.

Mr. Whitehead is the subject of appreciative reference in an editorial in the *Coventry Herald*. "In bringing this city's services to its present efficient state, despite grave initial and present-day difficulties," the journal says, "Mr. Whitehead has deserved and gained the gratitude of the community. It is pleasing to see that his fellow workers, who are able to estimate his services in a more expert manner than the ordinary person, think of Mr. Whitehead with so much admiration." Noting that it was only shortly before Mr. Whitehead's advent that the old steam tramcars were replaced by electric vehicles, the paper says the present manager and engineer has seen the task through from the beginning. "It is nothing short of wonderful that, working a modern tramway along roadways constructed to take the slow and limited traffic of a small town hundreds of years ago, we see so excellent a service as Coventry possesses to-day."

BELFAST CITY TRAMWAYS.

A financial statement on the working of Belfast City Tramways for the year ended March 31 last was made by Councillor W. C. Turner (chairman of the Tramways Committee) at the quarterly meeting of the Council on August 2.

Councillor Turner said the total revenue amounted to £601,183 for the twelve months, as against £545,347 for the corresponding period in 1920, an increase of £55,836. The working expenses amounted to £503,555, against £379,088 for the previous year, and showed an increase of £124,467. The items contributing to this were as follows—Traffic expenses, £233,017, against £190,321 for 1920, an increase of £42,696; general expenses, £32,289, against £30,820, an increase of £1,469; general repairs and maintenance, £135,149, against £88,974, an increase of £46,175; power, £99,092, against £68,974, an increase of £30,118. The balance carried down to net revenue account, including an item of £5,365 bank interest, amounted to £102,944, compared with £169,476 for 1920.

Against this account the following standing charges were to be debited—Interest, £51,393; sinking fund, £43,215; income-tax and sundry charges, £23,021; and depreciation and renewals, £25,000; a total in all of £142,629, against £134,325 for 1920. The increase of £8,304 shown in these figures is mainly accounted for by higher income-tax charges. The additional expenditure viz., £124,467 on revenue account, £6,112 on net revenue account, and £42 on appropriation account, amounting in all to £130,621, transformed the surplus of £35,150 for the previous year into a deficit of £39,635 for the year ended March 31, 1921. The revenue had increased to the extent of £55,836, or 10·2 per cent., during the twelve months. Unfortunately, as predicted last year, this was a decrease of 24·2 per cent. as compared with the corresponding period. The expenditure also showed an increase over the corresponding period last year of £124,467, or 32·83 per cent. This great rise in expenditure was accounted for by high cost of material, arrears of maintenance, increased wages bill, and by excessive power supply charges. That the increased fares put into operation in July 1920, and March 1921, were necessary was fully borne out by the results.

In an interesting review of the work of the past year the chairman touched upon a number of the activities of the committee. Referring to the new cars, which were described and illustrated in our issue of March 17, 1921, he mentioned that twenty-eight of these vehicles had been delivered by the end of March, and were now in service, while the completion of the order was expected during the remainder of the financial year. The condition of the permanent way had received careful attention, and after long consideration and negotiations with the Minister of Transport, the committee had arrived at the decision to adopt a five-year programme, involving the reconstruction of approximately six miles of track at an estimated cost of one and a quarter millions. The contract for the first year's programme had been placed with the Consolidated Construction Company, of London, and a start was about to be made with the work.

During the year under review the Bellevue Gardens were officially opened by the Lord Mayor, and with the limited resources at their disposal the committee had endeavoured to make this beautiful spot as attractive as possible by providing good music and a frequent service of cars. Judging by the thousands of citizens who took advantage of the facilities, the decision of the committee to open these grounds had been fully justified. On a single day in July no less than 24,000 additional passengers were carried on the Bellevue route. It was anticipated that the adjoining estate of Hazelwood would be purchased, and with the Council's approval the committee proposed to continue the development of Bellevue, as they believed that eventually the city would thus be provided with one of the finest pleasure grounds in the United Kingdom.

The undertaking had passed through a very trying year, and the chairman said he wished publicly to acknowledge the harmonious manner in which the members of the Tramways Committee had worked in the best interests of the citizens. He would like to pay a tribute to the general manager, Mr. Moffet, and to the whole of the staff for their loyalty and services to the undertaking. The best of feeling existed between the committee and the whole of their employees. During the next year or two the greatest possible caution would have to be exercised in the conduct of the undertaking, as the work of reconstruction and the reapir of the whole of the track, cars, and equipment would involve an expenditure of very large sums of money. In reply to some comments on the report, which were generally of a favourable character, Councillor Turner mentioned that the Tramways Committee were paying about four times as much for their power as they did a few years ago. The Electricity Committee had the sympathy of the members of the Tramways Committee, who hoped they would come successfully out of the wood.

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GENERAL ELECTRIC COMPANY.

WORKS ENLARGED TO MEET FOREIGN COMPETITION.

The annual meeting of the General Electric Company, Limited, was held on July 21 at Magnet House, Kingsway, W.C.

Mr. Hugo Hirst (chairman and managing director), who presided, opened his speech with a fitting personal note. "It is with a sense of great pride that I address you from this platform to-day," he said. "When in 1889 I assisted as one of the founders in the formation of this company, with a registered capital of £30,000, I little dreamt that it would be my good fortune to direct its affairs for thirty-two years. In spite of my most enthusiastic belief in the future of the electrical industry, I could not then imagine that we should grow into a world-wide concern that would find it necessary to build its own home suitable for its own specific purposes."

After alluding to the completion of the new headquarters of the company (which we describe in another column), the chairman referred to the balance sheet, of which, he said, they had every reason to be proud. "Year after year writers and speakers—who imagine they are doing a service to labour—point to the growth of our results as if it were wrong to progress, or as if the results were extorted at the expense of the manual workers in our organisation. They either do not or will not understand that the results are due to joint efforts—that capital and the brain workers are doing their share as well."

MEETING FOREIGN COMPETITION.

Dealing with the growth of electrical concerns in other countries since the war, Mr. Hirst said—"It is no use replying to these mammoth organisations by the disjointed efforts of the 60 or 80 small specialist electrical concerns which this country had before the war. In order that Britain should have its share in the electrical work of the world, bigger groups had to arise, and we, for one, have laid ourselves out accordingly. Every one of our works has been enlarged or modernised. A great deal of money has been spent in improving the conditions under which work will be carried on in the future, welfare arrangements for the comfort and happiness of the workers playing an important part. Laboratories and development departments have been started, and results—modest as they are so far—have already added to our prestige."

Turning to the problem of increasing the efficiency of turbines and generators, the chairman emphasised the magnitude of this task at the firm's engineering works—"Only 6 per cent. of the calorific value of coal can at present be transformed into electrical energy," he said. "Any success in improving this inefficient figure, however slight, tends towards preserving our valuable raw materials. It will help to make problems of generation, distribution and application of electrical energy practical, which, as yet, are not economic or feasible—another important benefit of industry. . . . To-day I am as convinced as ever that throughout the world the demand for electric light and power is greater than ever. The whole world considers wherever possible large hydro-electric schemes to counteract the absence or the dear price of coal. The whole world is considering power-stations of one kind or another. Railway electrification schemes in this and almost every country are pressing. "Mines, steelworks, and factories all the world over had to be modernised. New fields would be opened for lamps, fittings, motors, heating apparatus, and the whole range of products for which the company had ever been famous. "We have prepared ourselves to meet all these demands and to have our fair share of the world's work," Mr. Hirst concluded.

ANNUAL REPORT.

The annual report showed net profits for the year ended March 31, 1921, of £796,149, plus £175,668 brought in. Depreciation amounted to £157,915, contributions to pension fund £17,266, and the directors recommended carrying forward, subject to excess profits duty (if any) and Corporation tax, £348,094. Owing to the present state of industry the directors considered the usual allocation to reserve inadvisable, and recommended that the amount which they would have allocated under normal conditions should remain in the amount carried forward, which thus stands at £348,000. The reserve has benefited during the year by £257,016 through transfer of net premiums received on share issue, thus making the total of this account over £700,000. The assets, £11,000,000, show an increase of approximately £4,000,000. A dividend of 10 per cent., free of income-tax, on ordinary shares for the year has been declared.

One-Man Railless Cars.—Bradford Corporation Tramways Committee have recommended that as the present railless trolley vehicles become unfit for further repair there be substituted for them railless cars of the one-man type; that the manager be authorised to make arrangements for the provision of six cars at an estimated cost of £1,800 each; that tenders be invited for the chassis and equipment; and that the bodies be built in the tramway workshop.

LIVERPOOL TRAMWAY DEVELOPMENTS.

PROPOSED EXPENDITURE OF £143,000.

The examination of the Liverpool Corporation Bill, including important tramway clauses, was concluded by the Local Legislation Committee of the House of Commons on June 30. Mr. J. A. Brodie, the city engineer, gave the estimate for the new tramway schemes as £143,000.

Mr. P. Priestly (general manager) said the line to Garston would accommodate 8,000 persons who would ultimately be employed at a large factory being erected there. The Ministry of Transport objected to the Corporation's proposal that a period of thirty years from the date of borrowing should be allowed for the repayment of the £143,000, and suggested that twenty years should be the limit. Mr. Brodie said that under present circumstances, and so far as he could foresee, there would be no scrapping of tramways in Liverpool in the next 30 years. On the other hand, equipment was improving and would last longer. He mentioned steel rails as an instance. The experience of Liverpool was that tramways paid but that omnibuses did not. Per passenger mile the tramcar cost much less than the omnibus, all costs included. The Corporation out of ordinary revenue kept both track and equipment up to date and in excellent condition, while they had also paid off capital liability, so that while the total was originally £2,240,000, it now stood in the books at only £384,396. With this policy maintained the new tramways at the end of thirty years would be in excellent condition, and the capital liability discharged. In reply to Mr. Erskine, Ministry of Transport, Mr. Brodie said that in Liverpool there had been no material interference with the foundations of the tramway track because the Corporation did a good deal of the work themselves. Mr. Erskine.—That is not the experience elsewhere. It is most unusual to give thirty years for repaying money spent on equipment. After considerable discussion the committee agreed to allow the thirty years desired, in respect of both construction and equipment. The Bill, as amended in certain instances, was ordered to be reported.

BUSINESS NOTICES.

MESSRS. WILLIAMS, PELL AND BARING have removed to 4, Regent Square, Gray's Inn Road, W.C.1.

THE GENERAL ELECTRIC COMPANY, LIMITED.—The publicity organisation of the General Electric Company, Limited, has been removed to Magnet House, Kingsway, London, W.C.2. (Tel. No. Regent 7050, 50 lines.)

MARINE MOTOR SHOW.—The Marine Motor Show will be held at White City in November in connection with the Motor Exhibition. The buildings in which the Marine Motor Show will be installed are directly connected with the Motor Exhibition.

DUFF MANUFACTURING COMPANY.—In consequence of the liquidation of the Duff Jack Sales Company, Limited, who have hitherto been the agents for the Duff Manufacturing Company in this country, that company has now opened offices at Ulster Chambers, Regent Street, London, W.1 (telephone number, Regent 3460). Mr. T. W. Cumner, formerly managing director of the Duff Jack Sales Company, Limited, has been appointed manager of the Duff Manufacturing Company for Great Britain, and will be able to give any information or quotations required for their lifting jacks.

THE PECKHAM TRUCK AND ENGINEERING COMPANY, LIMITED, of Audrey House, Ely Place, Holborn, E.C.1, announce that they are the sole selling agents of Brecknell, Munro and Rogers, Limited, of Bristol, for the supply of all overhead equipment. They are also tramway selling agents for the Phosphor Bronze Company, Limited, for the supply of tramway bearings, armature bearings, white metal, etc., and selling agents for the Malleable Steel Castings Company, Limited, for all types of malleable castings. The Peckham Truck and Engineering Company will exhibit at the Shipping, Engineering and Machinery Exhibition to be held at Olympia in September.

HOLLINGS AND GUEST, LIMITED, of Thimble Mill Lane, Birmingham, have just brought out a new design of Tire Press No. 14S. The special feature is an open slot in the head, so that tires can be fixed to or removed from Foden or other similar wheels without taking the wheels off their axles, the axle being more easily detached complete from the lorry. The firm make this new pattern press in various sizes to correspond to their standard No. 13 and No. 14 presses. In addition to the new feature the press is equally suitable for taking tires off ordinary wheels. The construction follows the company's well-known four-column girder type of frame, which gives lightness with maximum strength. A new runway and lifting gear is fitted to meet the needs of the slot head, which enables the wheel and axle to be carried right into the centre of the press table.

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TRAMWAY GOODS TRAFFIC.

BIRMINGHAM CITY ENGINEER'S VIEWS.

The possibility of increasing the utility of tramways in the direction of goods traffic was mentioned in the course of a paper on "The extension and co-ordination of arterial road schemes in the Midlands," read by Mr. Herbert H. Humphries, the Birmingham city engineer and surveyor, before a conference of the Institution of Municipal and County Engineers at Birmingham on July 8.

In considering the improvement of arterial roads long-sighted views were necessary, he said, and the planning must be undertaken upon generous lines if satisfactory provision was to be made, not only for the vastly increased traffic which was coming, but also for that traffic to travel safely at very much higher speeds than at present. The Birmingham arterial road cross section provided for a space in the centre of the roads for a tramway track upon wooden sleeper or light railway construction, of a width of 53 ft., leaving sufficient room in the space so reserved for trees and also a narrow strip of standing-room. On either side of the central strip was a carriage way, 24 ft. in width, on the other side of each of which was a footpath 19 ft. 6 in. in width. For roads within town limits that form of construction had many advantages. It placed the provision for tramways in the centre of the road, and thus furthest from the road boundaries, and should the reservation not be required for that purpose, it might be utilised for motor omnibus traffic, overhead trolley railless cars, or other fast travelling vehicles.

In connection with the form of cross section to be adopted, the possibility, and especially on those lengths of road connecting up urban areas, the probability of provision being required for tramways must be borne in mind. The great cost of construction and maintenance of tramways upon the ordinary solid method of construction might retard and even prevent extensions of tramways upon that system, but that did not apply to those constructed upon sleeper track or light railway principles, which system, given sufficient traffic demands, would always prove a formidable opponent to motor omnibus competition. The sphere of usefulness of such tramways might be greatly extended, especially in the way of carrying goods and produce, connections being made to warehouses, markets, railway goods stations, clearing stations, etc.

MUNICIPALITIES AND OMNIBUS POWERS.

DUNDEE COMMITTEE'S UNSUCCESSFUL APPLICATION.

The unsuccessful application of Dundee Town Council for powers to run motor omnibuses outside the city boundary was mentioned at the meeting of the Tramways Committee on August 8.

The general manager and engineer of the tramways (Mr. W. T. Young) reported that after this decision he thought no municipality would get power to run omnibuses outside its own boundaries by private legislation. The Municipal Tramways Association was alive to this fact, and every effort would be made to get powers by general legislation rather than by applications from independent Corporations. Private companies could run motor coaches in competition with the tramcars and over the roads which the tramway authorities had to keep up, and the companies paid nothing towards the upkeep. Corporations had not a fair chance.

A letter from the secretary of the Municipal Tramways Association stated that the question would be dealt with at a conference to be held at Salford.

Mr. A. Malcolm (convener of the Tramways Committee) said they could do no more in the matter meantime except agree to extend their support to the Association. He suggested that a small sub-committee be appointed to look after the undertaking's interest.

Bailie Fletcher asked what powers the Corporation had to stop privately-owned omnibuses plying within the city.

The Deputy Town Clerk replied that the Corporation had no such power.

In reply to a question, the convener said it was undoubtedly a fact that the omnibuses were taking revenue from the tramways

DANGER TO TRAMCAR QUEUES.

At a meeting of Dundee Police Committee on August 8, Mr. J. G. Fraser said if the Corporation had no powers to regulate street traffic it was time they had. In Glasgow motors had to stop within five feet of people getting off or on a tramway car. His experience in Commercial or Reform Streets was that motors went right through the groups of passengers waiting for tramcars. Chief Constable Carmichael said he had drawn up regulations for the governing of motor traffic. One of these was that motors should not pass a tramcar on the side from which passengers were alighting or boarding. The Liverpool Stipendiary, in imposing a fine of £5 and costs on a motor cyclist for dangerous driving, said, "It is a very dangerous practice for drivers of motor vehicles to attempt to pass between a stationary tramcar and the pavement."

EDINBURGH CITY TRAMWAYS.

The following is a summarised statement of income and expenditure for the year ended May 15, 1921, extracted from the report of the general manager, Mr. R. Stuart Pilcher.

INCOME.

	Cable.	Per Car-mile.	'Buses.	Per 'Bus-mile.	Electric	Per Car-Mile.
	£	d.	£	d.	£	d.
Passenger fares	603,828	24·550	91,435	25·685	85,322	19·560
Special hires	211	·009	1,289	·362	...	...
Parcels	2,395	·097	...	...	...	...
Advertising	3,000	·122	213	·060	468	·107
Rents	2,247	·091	...	...	130	·030
Miscellaneous	20	·001	62	·018	457	·105
Total income	611,703	24·870	93,000	26·125	86,378	19·802

EXPENDITURE.

	Cable.	Per Car-mile.	'Buses.	Per 'Bus-mile.	Electric	Per Car-mile.
	£	d.	£	d.	£	d.
Traffic expenses	228,501	9·290	31,099	8·736	26,927	6·173
General expenses	54,990	2·236	5,629	1·581	17,668	4·051
Repairs and maintenance ...	147,172	5·983	7,430	2·088	12,831	2·941
Power expenses	82,956	3·373	25,722	7·225	...	...
Electric current	496	·020	...	...	9,760	2·238
Total expenditure	514,117	20·902	69,881	19·630	67,187	15·403
Gross surplus...	97,585	...	23,118	...	19,190	...
Interest and sinking fund ...	67,513	...	10,689	...	13,820	...
Depreciation and renewals fund	...	...	...	...	5,525	...
Special expenditure	1,070	...	...	...	...	...
Income-tax...	8,871	...	...	...	4,485	...
Total	77,455	...	10,689	...	23,830	...
Net surplus	20,130	...	12,428	...	...	...
Loss	...	...	...	...	4,640	...

In the course of his report Mr. Pilcher states that as regards the cable system the total revenue for the year shows an increase of £40,782 as compared with the previous year. He believes there is little doubt that the year 1921-22 will hold a brighter financial outlook. As the costs of operation come down, fares will also call for revision.

Alluding to the motor omnibuses, Mr. Pilcher says their number has increased to 81 during the year, and adds that he does not think it would have been possible to keep the whole undertaking from rate relief without the aid of the omnibuses. During the summer of 1920 the department operated nine motor coaches for pleasure trips, but during the 1921 season the number was increased to 15. The total revenue for these tours for the year was £7,504.

A sum of £5,540 was spent on hardening one mile of double tramway track by the Sandberg process, and the treatment was quite successful.

The entire staff now numbers 1,826 employees.

PLYMOUTH CORPORATION TRAMWAYS.

The appended figures are extracted from a table issued by Mr. H. P. Stokes, engineer and general manager of Plymouth Corporation Tramways, relating to the quarter ended June 30 last. For nine weeks a restricted car service was necessitated by the coal stoppage, while the Sunday service was entirely suspended for eight weeks. The financial result, however, will be seen to be satisfactory.

Expenditure.	Tramcars.	Per Car-mile.	Omnibuses.	Per Omni-bus-mile.
	£ s. d.	d.	£ s. d.	d.
Power expenses	7,316 0 0	4·157	2,552 18 1	8·355
Traffic expenses	12,435 15 4½	7·064	2,744 6 11½	6·455
Maintenance and renewals	10,088 19 5	5·732	503 8 8½	1·184
General expenses	3,691 2 8½	2·096	353 5 7	·831
National Insurance, etc.	239 19 0	·135	22 0 2	·052
Repayment of loans and interest ...	4,258 0 0	2·419	1,314 11 0½	3·092
Income-tax	944 9 8	0·537	—	—
Total expenditure	38,974 6 2	22·140	8,490 10 6½	19·969
Total income	41,500 6 3	23·575	8,785 14 2	20·663
Net profit	2,526 0 1	1·435	295 3 7½	·694

"Safety First" and Tramcars.—The London Safety First Council, in its useful campaign against street accidents, has turned attention to tramway cars in its latest poster. This points out that there were 4,000 mishaps involving cars in the Metropolitan Police area, during 1920, and offers sound advice to motormen and conductors. "After dark, at badly lighted termini, trolleys should not be removed from the wire until all passengers have alighted" is one injunction.

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TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDEEN.

TRAMWAY DEPARTMENT'S TOURS.

A programme of sight-seeing motor omnibus tours has been put into operation by the Corporation Tramways. The trips, which follow a circular route, leave the tramway offices at 10 a.m. and return at 8 p.m. There is a choice of four tours, to the north, south, and west respectively, and a 20-mile special tour. The management have published a map and guide, in which opportunity is also taken to draw attention to the motor omnibus and tramcar facilities for seeing the city and visiting the neighbouring beauty spots.

BATH.

TRAMWAY MEMORIAL UNVEILED.

A memorial tablet to employees of the Bath Electric Tramways Company who fell in the war has been unveiled at the Tramways Institute, Walcot Street. The Rector of Bath dedicated the tablet, which was unveiled by Mr. W. E. Hardy, the general manager.

BEXLEY AND DARTFORD.

TRAMWAYS AGREEMENT APPROVED.

A meeting of Dartford Urban District Council on July 13 provisionally approved an agreement between the Bexley and Dartford Councils with respect to the future joint operation of the tramways. They also agreed that application be made to the Light Railway Commissioners to grant the Order applied for amending the amount required to be borrowed for capital purposes to £2,000 and £10,000 for repairs and reconstruction to the Dartford track. Clause 6 states that Bexley will operate and control the Dartford Light Railways until 1933.

BIRMINGHAM.

PROPOSED RAILLESS CARS.

The project of the Corporation Tramways for introducing railless trolley cars was referred to at the meeting of the City Council on July 19, when sanction was given to the preparation of the Corporation Parliamentary Bill, which will include these proposals, among others. Ald. Sir David Brooks (chairman of the General Purposes Committee) explained that powers were sought for the provision of railless electric traction over any tramway route now or hereafter to be authorised within the city. The Tramways Committee had had the subject brought prominently under their notice in connection with the reconstruction of the Nechells route. It was estimated that at the present prices of labour and materials the cost of reconstruction would be £95,000, and that the tramcars could not be run except at a loss, whereas if the railless system were adopted there would be less capital expenditure—a saving of about £54,000 and an estimated profit of £3,000 a year, as against a loss of the same amount if the tramcars were run on rails.

BRADFORD.

MISHAP AT CHURCH BANK.

A tramcar accident occurred at the foot of Church Bank—one of the steepest gradients in the city—on July 11. A Bradford Moor car from Forster Square had proceeded 20 or 30 yards up the hill when it began to slip backwards. The driver was unable to check it, and it collided with an Undercliffe car at the bottom of the gradient. There were not many passengers in either vehicle; a few suffered from shock and two or three received minor injuries for which they were treated at the Infirmary. The rear platform of the Bradford Moor car was damaged.

BRIGHTON.

STATE OF ROLLING STOCK—PROPOSED LOAN.

In his report for the past year the general manager says that the arrears of rolling stock maintenance work have been caught up, and that the cars are, if anything, in a better state than they were at the outbreak of the war. Since the war 50 new motor cars and equipment have been provided to replace those worn out, and in consequence the difficulty in keeping the cars in running order has largely disappeared. Eight new cars were built during the year to replace those broken up. Arrears of work are coming to an end, and it is expected that the cost of rolling stock maintenance will show a steady decline for some time to come. In view of the deficit on the Corporation Tramways of £6,822 (after applying £15,977 from the reserve and renewals fund towards special track renewals), the Town Council have adopted the recommendation of the Tramways Committee to apply to the Ministry of Transport for a short-term loan of £20,000. Alderman Lintott (chairman of the Committee) said there had been many exceptional difficulties. Work postponed during the war had to be carried out, and salaries and cost of materials had enormously increased, while the reserve fund was depleted through the Council seizing the surplus revenue in previous years. He opposed the Finance Committee's proposal that the deficit should be met from the rates. Councillor Lewis moved to refer the matter back, with a view to a supplementary rate of £6,822 for the second half of the year. He was against incurring heavy loan charges, which would probably burden them with an extra ½d. rate. After a long debate the amendment was lost, and Alderman Wellman moved that the proposed loan be £6,822, not £20,000. It seemed very unsound to borrow for ordinary renewals. Councillor Elliott urged that the borough accountant favoured the committee's recommendation. The amendment was lost, and the report of the committee adopted.

CARDIFF.

RECONSTRUCTED TRAMCAR.

By practically rebuilding one of their bogie cars, the Corporation Tramways Department has increased its original passenger capacity of 68 by 10. The canopies have been carried over the heads of the driver and conductor, and a rearrangement of the staircases has been effected. The platforms have been enlarged and improved, and protection from the weather is now afforded the driver. The work was carried out at the Roath works.

COLNE.

PROPOSED NEW CARS.

The Town Council have decided to apply to the Ministry of Transport for sanction to borrow £6,600 for the purchase of new tramcars.

GLASGOW.

A SUCCESSFUL YEAR—NEW BRIDGE PROPOSAL—SEQUEL TO ACCIDENT.

At Glasgow City Council on July 7, Bailie M'Whirr (chairman of the Tramways Committee) said they had had a very successful year. The revenue had increased by no less than £671,954. At the same time the expenditure had increased very considerably. On the year's working there was a surplus of £105,796, although they had still a debit balance to carry forward. In connection with the report from the Tramways Department and minutes of the Statute Labour Committee, in regard to the congestion of traffic at Jamaica Bridge, and a proposal to build a bridge across the Clyde at Oswald Street Mr. Bruce Murray moved that they reject such a proposal, and remit the matter back. He argued that the Council should pause before supporting the scheme, which would involve an expenditure of £1,000,000. The Tramways Committee had recommended that the Tramways Department should contribute half the cost of the erection of the bridge, while the Statute Labour Committee, on an amendment vote, rejected the offer by 11 votes to 10. On the Council taking a vote between the finding in the tramway minutes and that in the Statute Labour minutes, the tramway finding was carried. The First Division of Edinburgh Court of Session on July 1 set aside the verdict of a jury which awarded £250 damages in an action by Moses Elyan, 18 Aitken Street, Glasgow, against the Corporation of Glasgow, for £1,000 damages for the death of his son, who was run down by a tramcar while crossing Eglinton Street. The action was tried before a jury under Lord Anderson, and a unanimous verdict was returned for the pursuer, who was awarded £250 damages. The Division set aside that verdict, and entered judgment for the defenders. The Lord President said the verdict was clearly against the weight of the evidence, and could not stand.

GRIMSBY.

CORPORATION ACQUIRES TRAMWAY.

Grimsby Town Council have decided to purchase the tramways from the Great Grimsby Street Tramways Company as a going concern. Councillor J. Barker, who moved the purchase, said the Corporation would be able to provide a better public service without placing an extra burden on the rates. The agreement between the tramways company and the Corporation terminated on July 21.

HASTINGS.

CORPORATION AND TRAMWAYS COMPANY ARBITRATION.

Mr. W. W. Szlumper, as arbitrator appointed by the Ministry of Transport, has issued his award in the case of the Hastings Corporation and the Hastings Tramways Company. It concerned a point of controversy in the matter of the relighting on the line of tramways on the front, which the tramways company have to undertake under their Act of last year. The arbitrator states—The current required for the lamps upon the existing electric standards of the Corporation along the route of Tramway No. 1, referred to in sub-section (3) of section 6 of the Hastings Tramway Act, 1920, was conveyed by means of a cable belonging to the Corporation laid in the roadway. The substituted electric lamps necessitated either a new cable or an addition to the existing one. It was contended by the Corporation that the proper construction of the sub-section quoted provided that the company should, at their own expense, either lay a new cable or by addition to the existing one render it capable of conveying current to the substituted electric lamps. It was contended on the part of the company that the word "cable" in the sub-section referred only to a part of the connection between the substituted electric lamps and the cable of the Corporation, and did not place upon the company the obligation to lay

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any cable other than that necessary for connections. The arbitrator states in his decision that the provisions of the sub-section (3) place upon the company an obligation to provide and lay the necessary new cable or an addition to the existing cable. He also directs that the company pay the Corporation's cost and those of the award.

HULL.

NEW TRAMWAY OFFICES.

The Corporation Tramways Committee have recommended the purchase of the Turkish Baths for conversion into tramway offices, and the sub-committee who had gone into the matter resolved that the purchase price of £10,000, and the cost of necessary alterations estimated at £1,250, be paid out of the reserve fund.

LEEDS.

TRAMWAYS AND OIL FUEL—PROPOSED RAILLESS EXTENSION.

The respective merits and costs of coal and oil as fuel for power generation are to be investigated by the tramways department of the Leeds Corporation. It is understood that the future arrangements at the generating station will depend on the results of the tests. The Leeds tramways were operated for several weeks during the coal strike on power derived almost wholly from oil fuel. The Tramways Committee propose to enter into an agreement with the Morley Corporation and the East and West Ardsley District Council for the construction and equipment of a railless trolley-car system between Morley and Ardsley.

LEICESTER.

TRAMWAY STANDARDS SUPERSEDED.

The tramway standards have been removed from the main thoroughfare—Granby Street—and the trolley wires are now suspended from the buildings on either side. The local press notes a distinct improvement in the appearance of the street.

LIVERPOOL.

WAR CRIPPLES' PRIVILEGE—JURY'S RECOMMENDATION.

The Liverpool City Council has recently adopted a motion instructing the Tramways Committee to provide facilities for free travelling on the tramcars and motor omnibuses by ex-Service men who have lost a leg or the use of a leg owing to their war service. At a local inquest on a boy who was killed by a tramcar, the jury, in returning a verdict of "accidental death," exonerated the driver, but expressed the opinion that tramcars should be supplied with an apparatus to raise a car in case of accident, and further that the methods adopted in releasing the boy might have aggravated the injury.

MANCHESTER.

TRAMWAY SERVICE TO ENVIRONS—NEW CARS.

Following the purchase of the late Oldham, Ashton and Hyde electric tramways by the municipal authorities of Hyde, Ashton, Denton, and Audenshaw, the Manchester Corporation has extended its service by another 2½ miles, having taken running powers in Denton and Audenshaw. The new service opened by Manchester on July 2 is between Denton (Crown Point) and the Hyde Town Hall, and the fare was reduced from 2½d. to 2d. It is understood that the Corporation intend to conduct a "through" service from Hyde to Manchester when the track has been relaid. The distance is seven miles. Sixty new tramway cars are expected to be added to those of the Corporation during the present financial year, according to the annual report. During last year there were 53 new cars—15 of them constructed in the department's own workshops—added to the service, bringing the total number to 762.

NEWCASTLE-ON-TYNE.

TRAMWAYMEN'S GIFT.

The sum of £1,000 has been subscribed by the Corporation tramway employees to endow a bed at the Royal Victoria Infirmary, Newcastle.

PORTSMOUTH.

NEW ELECTRICITY PLANT—USE OF OIL FUEL.

The advisability of amalgamating the Corporation tramways and electricity departments was the subject of a report presented at a meeting of the Town Council by the Joint Sub-Tramways and Electric Lighting Committee. Reports of the two undertakings were considered, and it was pointed out that considerable extensions were being made at the electricity works, and that until the new plant was installed and in working order it was impossible to give a definite statement on the subject of the supply of electric current to the tramways. The committee resolved that in view of the reorganisation of the electricity works on modern lines, and the fact that the tramway station was generating current as cheaply as could reasonably be expected, the question of the amalgamation or unification should stand over for twelve months. The Council concurred. At a meeting of the Town Council, the Mayor, Councillor J. Timpson (who is also chairman of the Tramways Committee), replying to questions regarding the maintenance of the car service by means of oil fuel during the coal strike, said the engineer had arranged that oil fuel could be used now at any time. In the event of coal becoming cheaper, the undertaking would revert to the old method. Asked whether oil fuel could be used in conjunction with coal, the Mayor said that one boiler had been fitted for burning oil. He also remarked that the recent coal crisis brought about a condition with the tramways that the undertaking had never previously experienced; yet the services at Portsmouth were maintained. That could not have been done had not oil fuel been used.

ROTHERHAM.

WAGE SETTLEMENT CRITICISED.

At a meeting of the Town Council, the Tramways Committee recommended approval of the agreement of the Joint Industrial Council as to wages, but added that the Joint Industrial Council "be informed that the reductions should have been sufficient to cancel the whole of the war bonus and not affect the basic rates." The committee had received a reply stating that Rotherham was the only Corporation that had raised the objection, and to that a letter had been sent declaring that Rotherham Corporation was the only one that had had the moral courage to do so.

STOCKTON AND THORNABY.

TRAMWAYS AGREEMENT.

The agreement between Stockton and Thornaby regarding that part of the Tees-side undertaking of the Imperial Tramways Company which they have acquired was presented at a meeting of the Stockton Town Council. Each Corporation owns that portion of the permanent way and overhead equipment that lies within its own borough; the whole of the permanent way and electrical equipment at the Bridge Road and Norton depots belongs to Stockton, as do also the land and buildings at these two depots; Stockton owns three-quarters and Thornaby one-quarter of the miscellaneous stock, loose plant, tools, etc., and Stockton takes over 20 cars and Thornaby nine. The amount due to the company for consumable stores was £24,924, of which Middlesbrough (the other municipality which shares in the transfer), contributed £13,895, Stockton £7,384, and Thornaby £3,645.

SHEFFIELD.

A CRITICISED CONTRACT PROPOSAL.

A recommendation of the Corporation Electric Supply Committee to purchase a generating plant of German manufacture for £49,900 aroused much critical interest, but at a meeting of the City Council on July 13 the recommendation was withdrawn for reconsideration. The original proposal was as follows—"That on account of the low price the Council be recommended to purchase from the J. B. Whyte Taylor Marine Corporation a 10,000 KW. plant of German manufacture from the Amsterdam Corporation for the sum of £49,900, which price included the necessary skilled supervision for the erection of the machine, and that if this recommendation is approved by the Council, the general manager be instructed to proceed to Berlin with the chief engineer of the Amsterdam Corporation to inspect the plant. At the City Council meeting a letter was read from Mr. W. L. Hichens, the chairman of Cammell, Laird and Co. Ltd., in which he pointed out that the contents of a turbine are largely forgings and discs which are manufactured in Sheffield, and added—"I would suggest that it would be in the interests of Sheffield if this particular order were placed in England on the understanding that the forgings and discs are ordered from Sheffield. If the Sheffield City Council is going to set the example of buying the special products of Sheffield abroad, it is difficult to see how other Corporations can be persuaded not to follow their example."

TAUNTON.

COUNCIL AND LOCAL TRANSPORT.

The Town Council, at a recent meeting, took steps towards remedying the absence of passenger transport facilities in the town, caused by the withdrawal of the local Electric Traction Company's tramway service. A resolution was adopted instructing a special committee to consider and report on the purchase of the undertaking and its operation by the Council or the question of the provision of a motor omnibus service. A letter was read from the local Trades and Labour Council, who were of opinion that the local road transport, both goods and passenger, should be provided and controlled by the Council. The Mayor also reported the receipt of an offer by the National Omnibus Company to run an experimental service for one month.

WALTHAMSTOW.

FREE PASSES AND FARES.

The Light Railways Committee of the Urban Council have reported that they cannot grant free tramcar passes to all representatives of the West Ham Guardians when engaged on the business of the Board, but they recommend that passes be issued to Walthamstow representatives when attending such duties. The Council has concurred. An application is to be made to the Ministry of Transport for authority to increase fares.

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PERSONAL.

Mr. R. J. West, a director of the New General Traction Company and the Norwich Electric Tramways Company, Ltd., left £50,700.

Mr. Edward A. Wilson, M.I.C.E., has been appointed chief civil engineer to the Metropolitan Railway Co., in succession to Mr. W. Willcox, who has retired.

Mr. Carl G. Roebling, head of John A. Roebling, Son and Co., of Trenton, New Jersey, the well-known manufacturers of insulated wires and cables, died recently.

Mr. George Hally, of Birmingham, has been appointed chief works manager of the engineering side of the Edison Swan Electric Company, Ltd., Ponders End, Middlesex.

Mr. A. W. J. Talbot, hitherto London manager of Robert Kearsley and Co. Ltd., of Ripon, has been appointed a director of the company in succession to the late Mr. W. H. Kearsley.

Mr. Albert C. Rogerson.—The death has occurred in his 53rd year of Mr. Albert Chorley Rogerson, C.B.E., general manager of Beyer, Peacock and Company. Mr. Rogerson passed away suddenly at Cleveleys on July 10.

Mr. W. E. M. McCombe, a scholar of St. John's College, Cambridge, and son of Mr. W. J. McCombe, late manager of Hull Corporation Tramways, has taken second class honours in the classical tripos at Cambridge University.

Dr. Walter Rathenau, owing to his appointment as German Minister for Reconstruction, has resigned the presidency of the A.E.G., and he has also retired from the boards of other companies with which he was associated.

Major J. F. Chapple, D.S.O., who has succeeded Mr. E. A. Paris as general manager of the Yorkshire (Woollen) District Electric Tramways, Limited, has been in the service of the British Electric Traction Company for many years.

Mr. Joseph Wilkinson.—The death has taken place of Mr. Joseph Wilkinson, formerly engineer of Hull Corporation Tramways. The funeral at Hull Crematorium on July 11 was attended by several officials and employees of the department.

Mr. A. S. Black, borough electrical engineer of Southport, has been selected as the successor of Mr. Frank Ayton as borough electrical engineer and tramways manager of Ipswich. Mr. Black has been in the service of Southport Corporation since 1899, and has been borough electrical engineer for nearly twenty years.

Mr. B. T. Hawkins, electrical engineer to the St. Helens Corporation, has been recommended by Wallasey Electricity Committee for appointment as electrical engineer and manager of the Wallasey undertaking in succession to Mr. J. A. Crowther, who has resigned. Mr. Hawkins was selected from 190 applicants for the position. The salary recommended is £1,000 per annum, or £900 if the electrical engineer is allowed to take two articled pupils.

Mr. S. T. Allen, who was elected president of the Incorporated Municipal Electrical Association at the last annual meeting, is general manager and electrical engineer of the electricity department of Wolverhampton. He was previously chief assistant to the borough electrical engineer of Plymouth, a position that he held for seven years. Subsequently he was for five years city electrical engineer of Carlisle, and was appointed in 1913 to his present position.

Mr. H. W. Laing has completed 15 years as manager of the late Blackpool, St. Anne's and Lytham Tramways Company, Limited, now the St. Anne's Council Tramways. To mark the occasion the staff and employees have presented him with two silver-plated entrée dishes and a muffin dish. The presentation was made by Mr. G. W. Wood (traffic manager), who, with several other members of the tramways department, testified to the esteem in which Mr. Laing is held. In responding, Mr. Laing said that 15 years ago they were carrying something like 1½ millions of passengers a year, and were now carrying 10 millions; then they were running a quarter of a million miles and now about a million. They had carried about 100 million passengers and run 12 million miles since he took charge.

Mr. Alex. R. McCallum has resigned his position with the London Underground Group and has accepted an appointment with Messrs. C. P. Sandberg Brothers, of Grosvenor Gardens, S.W. Mr. McCallum joined the London United Tramways in 1908, and obtained a varied experience in the different departments. Previous to joining the London United Tramways, Mr. McCallum studied at the Central Technical College, receiving the degree B.Sc. from the London University, and later was a pupil at Dick, Kerr and Company's Preston works. In 1912 he joined the staff of the London Underground Group as assistant to the mechanical engineer. In March, 1915, he was appointed chief assistant to the mechanical engineer, having charge of all rolling stock, workshops, and running repairs to trains. In the autumn of 1919, in company with three other officials of the company, he visited the United States to make a study of electric traction conditions there.

CONTRACTS AND ORDERS.

The English Electric Company, Ltd., have an order from Salford Tramways Committee for four tramcar controllers, at £390.

Leeds Corporation Tramways Committee have accepted tenders for 300 steel tires for cars from the Monkbridge Iron and Steel Company, Limited.

Mexborough Council have accepted a tender from the General Electric Company, Ltd., for 750 K.W. rotary converter with transformer at £4,405.

Taunton Corporation placed an order with the Anglo-American Oil Company for 600 tons of standard oil for the electricity works at £5 5s. per ton.

Warrington Electricity and Tramways Committee, after further consideration, has cancelled its contract with the Anglo-Belgium Improvements Corporation for tramway rails.

Newcastle-on-Tyne Corporation have accepted the following tenders—Hadfields, Ltd., tramway turn-outs and cross-overs, £4,299; United States Steel Products Co., tramway junctions, £18,213.

Turbo-Alternator for Sydney.—Reuter states that the Sydney Council have accepted a Victorian tender of £125,000 for turbo-alternators in connection with the installation of new plant, costing £500,000.

Bradford Tramways Committee have recommended the tender of Walter Scott, Ltd., to supply 48 tons of steel tramway rails, at £20 per ton for high silicon steel rails, and £21 per ton for rails treated by the sorbitic process.

Leeds Tramways Committee have accepted the following tenders—Pettivel and Co., for a quantity of steel tires for cars; the Anglo-American Oil Co. Ltd., for three months' supply of oil fuel; Brookes, Ltd., for 1,000 tons of tarred slag.

Chamberlain and Hookham, Ltd., Solar Works, Birmingham, have secured contracts for a twelve months' supply of electricity meters to the following municipalities—Glasgow, Belfast, Battersea, Gloucester, Islington, Bath, and Llandyther.

Straker-Squire, Limited, recently delivered a number of new omnibuses to the Progressive Motor Omnibus Company, who are putting on quite a large fleet of Straker-Squire vehicles, which include both single and double-deck omnibuses.

South Shields Corporation Tramways.—The committee have accepted the following tenders—Rails and fishplates, Dorman, Long and Co., Middlesbrough, £8,669; overhead equipment and copper bands, R. W. Blackwell and Co., London, £777; tramway poles, British Mannesman Tube Co., London, £1,198.

Rotherham Town Council have accepted the tender of Steel, Peach and Tozer, Ltd., for the supply of 400 tons of Sandberg steel tramway rails at £27 15s. per ton. Alderman Crummer said one reason why the contract was given to this firm was that a certain amount of employment would be found for local men.

Edinburgh's New Cars.—The Tramways Committee of Edinburgh Town Council have recommended acceptance of the tender by Hurst, Nelson and Company, of Motherwell, for 16 new electric car bodies at £1,220 each, or a total of £19,520. A sub-committee have recommended that a contract be placed with the North British Rubber Company, Edinburgh, for the supply of tires for the Corporation omnibuses.

London Order goes to Switzerland.—The London County Council have accepted the tender of Messrs. Brown Boveri, of Baden, Switzerland, for a 8,000 KW. turbine at £45,000 for Greenwich power station. The difference between the amounts of the tenders of the English and the Swiss firms is understood to be between £6,000 and £7,000. The English firms were asked to amend their tenders on the understanding that they might obtain their raw material abroad, and they accordingly submitted revised prices.

Glasgow Corporation have accepted the following tenders—Callenders' Cable and Construction Co., Enfield Ediswan Cable Works, Ltd., W. T. Glover and Co., and General Electric Co., 12 months' supply of cables; Ediswan Electric Company, Ferranti, Ltd., Chamberlain and Hookham, and Metropolitan-Vickers Electrical Co., 12 months' supply of meters; British Thomson-Houston Co., rotary converter, £9,300; General Electric Co., converter, £9,074; Metropolitan-Vickers Electrical Co., transformers, £1,556; British Thomson-Houston Co. for switchgear for the turbo-alternator at Pinkston power-station. The Tramways Committee have also recommended acceptance of the following—Iron and steel, P and W. MacLellan, Ltd.; ⅞-in. square black nuts, Nuts and Bolts, Ltd.; dash lamp reflectors, W. C. Yuille and Co. Ltd.; hardwood cuttings for permanent way, H. J. Stewart and Bros., Mowat and Miller; telephone and test lead-covered cable, Western Electric Company, Ltd.; renewing parts of filter at Pinkston power-station, Cleworth, Wheal and Co. Ltd., electric welding plant, Electric Apparatus Export Corporation.

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PATENT LIST

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

Applications for Letters Patent.

The number of the patent is given in brackets.

Terminals for rail bonds, etc. (17,964)—F. C. Brittain and Westinghouse Brake and Saxby Signal Company, Limited.
Brakes for motor vehicles (17,709)—Z. Crabtree and L. W. Hewitson.
Speed control mechanism for motor vehicles (17,828)—Etablissements Industriels J. Bignan.
Vehicle bodies and hoods therefor (17,522)—S. Gage and London General Omnibus Company, Limited.
Direction indicator for motor vehicles (17,474)—A. G. Kent-Johnston.
Electrically braking motor vehicles (17,621)—P. V. Powell and P. F. Smith.
Chars-a-banc hood (17,858)—E. Redfern.
Levers of brake rigging of electric tramcars and trailers (18,271)—J. P. Barker.
Car control equipments (18,446)—British Thomson-Houston Company, Limited (*General Electric Company*).
Lifting jacks (18,581)—J. Coryell.
Journal box (18,593)—L. Lotte.
Tramcar, etc., wheels (18,137)—H. N. Lucy.
Motor vehicles (18,211)—A. Morgan.

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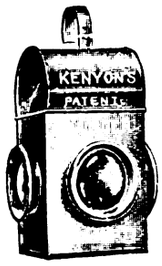

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Lifting jack (18,095)—R. Page.
Sprag or emergency braking apparatus for vehicles (18,149)—C. B. Richmond.
Springing and lubrication of motor vehicles (18,206)—J. G. P. Thomas.
Springing of road and rail vehicles (18,207)—J. G. P. Thomas.
Variable speed gear for motor vehicles (18,167)—W. Wilkie and Raleigh Cycle Company, Limited.
Change speed gear operating mechanism for motor vehicles (19,221)—Armstrong Siddeley Motors, Limited, and F. R. Smith.
Life-guard for automobiles (19,003)—H. H. Hancock.
Lifting jacks (18,721)—A. Hill, J. Hill, and W. Morrall.
Tramway rails (19,135)—F. Leonard.
Steering mechanism for road vehicles (19,081)—O. D. North.
Motor vehicles (18,886)—L. Renault.
Direction indicator for motor vehicles (19,017)—G. Roberts and J. Wilkinson.
Rail joints (18,913)—B. Shares.
Power transmission or driving gear (19,280)—L. Anderton.
Electrical cables (19,492)—British Insulated and Helsby Cables, Limited, and W. P. Fuller.
Devices for raising and lowering trolleys in overhead electric traction systems (19,353)—Metropolitan-Vickers Electrical Company, Limited, R. Brooks, and A. Priestley.
Electric traction (19,354)—Metropolitan-Vickers Electrical Company, Limited, R. Brooks, and A. Priestley.
Bodies of motor chars-a-bancs and omnibuses (19,622)—C. Dodson.
Permanent way keys (19,768)—R. W. Griffiths.
Jointing of rails (19,437)—D. H. Lee.
Suspension devices for motor vehicles (19,675)—R. Merville.
Electric railway control systems (19,647)—Metropolitan-Vickers Electrical Company, Limited.
Lifting jacks (19,725)—H. L. Smith.
Spring wheels for motor vehicles (20,337)—F. H. Addis.
Head fittings for motor vehicles (20,341)—A. S. Cheston and H. L. Sleigh.
Foot brakes for motor vehicles (20,037)—T. Dawson and the Daimler Company, Limited.
Bonnet fastenings for motor vehicles (20,038)—C. M. Simpson and the Daimler Company, Limited.
Brakes for motor vehicles (20,508)—W. T. Groom.
Dynamo-electric machines for motor vehicles (20,360)—H. Foxton.
Foot-brakes for motor vehicles (20,037)—G. H. Henson.
Automobile jack (20,026)—S. Heymann.
Motor vehicles (20,111)—A. Lythe.
Guides for trolley heads for electric traction (19,877)—W. Peake.

Specifications Published

1918

Strap-hanging devices for tramway cars, etc. (3,215—*165,110*)—W. T. Nicholson.
Pumps for charging self-oiling tram-wheels (9,504—*165,458*)—D. J. Davies and Haslam and Stretton, Limited.

1920

Transmission gear for motor vehicles (3,028—*164,078*)—H. Edmunds, A. M. Banister, P. A. Grimes, F. J. McCarty, R. D. H. Thompson, and B.M.R. Company, Limited.
Driving mechanism of automobile vehicles (3,066—*164,079*)—V. S. Ashby.
Electric trackless or railless tramway cars and electric transport wagons (6,117—*164,108*)—G. A. Bishop and R. A. Chadwick.
Devices for lifting and supporting motor vehicles (8,265—*164,176*)—L. M. Fisher.
Direction indicators for vehicles (10,985—*164,208*)—A. Latshaw.
Electrical contact makers for use with the steering wheels of motor vehicles (12,523—*164,217*)—J. L. Scott.
Arrangement of the steering mechanism in power-driven vehicles (14,972—*154,171*)—Argus Motoren Ges.
Seat cover for motor omnibuses, etc. (16,296—*164,244*)—W. A. Blagg.
Railway rail removing and laying apparatus (16,794—*164,250*)—T. Dutton.
Lifting jack (16,827—*145,505*)—S. A. King.
Radiators or coolers for motor-driven vehicles (20,711—*148,888*)—H. Junkers.
Variable speed gear for motor vehicles (34,335—*154,918*)—H. Keitel.
Direction indicators for vehicles (3,172—*164,412*)—J. W. Boughton.
Change speed power transmitting mechanism for motor vehicles (3,740—*164,426*)—T. H. Duncombe.
Safety controlling gear for electrically propelled vehicles (5,942—*164,437*)—R. Garrett and Sons, Limited, and H. R. Simpson.
Mechanism for indicating the rate of fuel consumption in respect to distance run and movements produced by motor vehicle engines (5,990—*164,438*)—A. R. Stuber.
Vehicles (6,916—*164,480*)—S. Gage and London General Omnibus Company, Limited.
Chairs or the like (6,917—*164,481*)—S. Gage and London General Omnibus Company, Limited.
Passenger vehicles (6,918—*164,482*)—S. Gage and London General Omnibus Company, Limited.
Safety devices for motor road vehicles (8,259—*164,541*)—W. H. Rusbridge and L. S. Nunn.
Electrically driven vehicles (19,865—*147,820*)—British Thomson-Houston Company, Limited.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	July 1	July 8	July 15	July 22	July 29	July 2	July 9	July 16	July 23	July 30	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdeen Corporation	4,028	3,965	4,170	5,240	5,332	3,983	3,819	4,226	4,450	4,283	8½	30,892	− 4,552
Aberdeen Motor Buses	...	...	...	54	114	326	366	411	631	574	8½	3,427	+ 3,259
Ayr Corporation	766	1,003	1,275	2,188	1,221	793	970	1,241	1,795	1,141	11	9,894	- 690
Barrow Corporation	952	895	974	1,006	981	951	1,000	1,032	1,007	931	17	15,611	+ 704
Belfast City Tramways	11,465	11,980	11,791	11,178	...	13,541	13,131	12,186	11,666	...	16	208,977	+ 19,932
Birkenhead Corporation	3,160	3,030	3,046	2,944	3,019	2,725	2,707	2,659	2,571	2,585	17½	43,852	− 9,223
Birkenhead Motor 'Buses	388	496	566	522	591	925	968	950	943	867	17½	13,305	+ 6,273
Birmingham Corporation	28,104	27,871	33,510	33,943	32,319	29,518	29,610	29,235	28,987	28,598	17	510,376	+ 6,117
Birmingham Motor 'Buses	1,967	1,913	2,178	2,167	1,963	2,283	2,296	2,245	2,109	2,009	17	38,037	+ 2,277
Blackburn Corporation	2,644	2,459	2,800	2,637	2,650	2,404	2,491	3,020	2,837	2,569	17½	39,275	− 6,005
Bradford Corporation	12,337	11,979	13,305	12,510	12,504	12,784	14,830	14,834	13,999	14,499	18	288,804	+ 9,192
Burnley Corporation	3,579	3,062	3,545	3,650	3,683	3,101	3,090	3,550	3,318	3,561	—	—	—
Burton-on-Trent Corporation ...	...	...	600	610	654	...	...	643	641	667	17	10,782	+ 738
Bury Corporation	2,581	2,575	2,619	2,581	2,775	2,576	2,599	2,584	2,472	2,542	17½	42,559	− 3,802
Chatham and District	1,921	1,853	1,979	1,995	1,876	1,607	1,698	1,739	1,696	1,811	30	48,905	− 878
Derby Corporation	2,326	2,186	2,355	2,408	2,415	3,444	2,149	2,290	2,310	2,300	17	36,830	− 2,393
Dundee City	2,821	2,956	2,694	3,045	2,926	3,685	3,607	3,504	3,485	3,362	10½	36,521	+ 6,877
East Ham Corporation	2,037	2,069	2,090	2,134	2,064	2,137	2,302	2,227	2,096	2,143	17½	36,992	+ 4,064
Edinburgh Corporation	17,246	14,238	14,285	17,481	15,501	16,584	15,146	15,275	15,145	12,993	11	157,968	− 1,812
Edinburgh Motor 'Buses	738	739	718	1,178	1,038	4,788	4,259	4,156	4,112	3,648	11	49,996	+ 42,339
Glasgow Corporation	44,964	43,513	41,961	31,588	37,746	50,225	46,880	43,245	33,445	37,289	8½	391,450	+ 30,577
Glossop (Urban Elec. Supply Co.)...	*Nil	*124	215	235	242	204	203	221	204	219	31	7,146	+ 259
Halifax Corporation	3,919	3,451	3,637	3,818	3,693	4,246	4,948	5,116	4,800	4,591	16½	71,285	+ 6,485
Halifax Motor 'Buses	101	93	97	101	98	107	121	124	116	52	16½	1,763	− 45
Halifax Railless Cars	...	...	...	...	...	...	...	...	...	65	—	—	—
Huddersfield Corporation	5,416	5,016	5,369	5,382	5,382	5,630	5,623	5,476	5,310	5,546	18	95,787	+ 15,602
Ilford U.D. Council	1,278	1,220	1,284	1,375	1,292	1,595	1,606	1,565	1,519	1,514	17½	27,135	+ 5,221
Ipswich Corporation	1,048	1,045	1,120	1,116	1,153	786	962	1,025	1,010	1,047	17	14,578	- 2,613
Isle of Thanet...	1,814	1,708	2,250	2,419	2,500	1,786	1,810	2,206	2,487	2,703	42½	37,297	- 1,734
Kilmarnock Corporation	394	389	408	454	465	377	369	378	404	426	10½	4,136	− 61
Leicester Corporation	6,918	6,809	7,150	7,658	6,951	6,948	7,282	7,385	7,831	7,267	—	—	—
Liverpool Corporation	28,766	28,115	28,923	29,369	...	31,594	33,084	32,204	31,926	...	29½	824,795	+ 36,018
London County Council	86,258	88,970	88,505	90,520	86,569	102,127	107,635	107,257	103,674	102,399	17	1,709,687	+ 270,429
Maidstone Corporation	556	506	528	563	495	489	584	506	524	497	16	8,284	− 182
Manchester Corporation	34,956	35,189	36,369	35,844	34,262	41,266	42,024	40,171	38,993	38,785	17	694,110	+ 172,637
Newcastle-on-Tyne Corporation ...	10,353	10,532	10,968	...	11,102	10,411	11,033	11,616	...	11,668	16½	196,279	+ 5,961
Nottingham Corporation	7,800	7,743	7,845	7,899	7,776	5,885	6,715	7,281	7,365	7,342	17	98,501	− 35,079
Oldham Corporation	4,695	4,799	4,964	5,064	5,146	4,765	5,084	4,903	4,854	5,782	19	88,956	+ 3,679
Reading Corporation	1,691	1,671	1,717	1,709	1,599	1,633	1,696	1,735	1,675	1,646	17	26,795	− 1,945
Reading Motor 'Buses	216	268	325	314	292	355	377	380	379	385	17	6,060	+ 1,798
Rotherham Corporation	2,637	2,535	2,713	2,731	2,773	1,949	2,021	2,134	2,199	2,400	16	33,477	− 8,281
St. Helens Corporation	2,128	2,008	2,094	2,130	2,062	1,898	1,973	2,069	1,969	1,944	17	30,998	− 2,524
Sheffield Corporation...	20,400	21,125	21,720	21,333	21,254	20,234	20,242	19,990	20,135	20,041	17½	341,806	− 21,647
Southampton Corporation	3,471	3,295	3,453	3,643	3,586	2,825	3,051	3,308	3,332	3,383	17	46,259	− 8,490
Southampton Motor 'Buses	242	212	238	245	239	219	129	92	90	91	17	4,169	+ 180
Southend Corporation	...	...	...	...	3,369	...	...	...	...	3,995	18	38,713	− 3,163
South Shields Corporation	1,914	1,891	1,961	2,039	2,044	1,563	1,667	1,794	1,873	1,876	18	28,149	− 4,939
Sunderland Corporation	2,915	3,142	3,214	3,394	3,389	2,655	2,788	2,888	3,023	3,024	17	44,774	− 9,858
Swindon Corporation	390	323	369	402	390	417	423	372	406	416	16½	6,785	+ 316
Tyneside Tramways and Tramroads	2,059	973	1,200	1,217	1,231	1,752	944	1,332	1,265	1,156	4	4,699	+ 76
Wallasey Corporation	2,549	2,542	2,764	2,892	2,918	3,054	3,315	3,305	3,137	3,173	17½	49,310	+ 3,382
Wallasey Motor 'Buses	210	...	...	218	197	332	...	...	297	325	17½	4,611	+ 1,339
Walsall Corporation	1,695	1,739	1,788	1,742	1,745	1,618	1,680	1,707	1,681	1,737	18	28,747	− 1,887
Walsall Motor 'Buses	986	1,012	1,033	1,021	1,106	858	917	983	1,032	1,044	18	15,764	− 1,964
Walthamstow U.D. Council	2,125	2,001	2,159	2,263	2,014	2,310	2,507	2,472	2,275	2,252	17½	39,438	+ 2,981
Warrington Corporation	1,065	975	935	960	985	1,040	1,058	966	990	995	17	16,445	− 292
West Ham Corporation	5,365	5,393	5,398	5,511	5,383	6,272	6,470	6,572	6,226	6,057	17	100,484	+ 7,073
Wolverhampton Corporation ...	2,376	2,507	2,534	2,354	2,917	2,341	2,390	2,361	2,299	2,811	18	41,725	− 2,641
Wolverhampton Motor 'Buses ...	394	397	414	436	551	664	644	692	662	922	18	11,671	+ 4,454

Underground Electric Railways Company of London, Limited.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	July 1	July 8	July 15	July 22	July 29	July 2	July 9	July 16	July 23	July 30	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Underground Rlys. & L.G.O. Co. ...	...	...	...	...	...	251,822	254,442	245,495	240,797	241,765	30	7,172,412	—
London and Suburban Traction ...	...	...	...	...	...	62,103	63,785	61,797	60,402	60,255	30	1,652,298	—

Colonial and Foreign Tramway Traffic Returns.

Companies Issuing Weekly Returns.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	July 1	July 8	July 15	July 22	July 29	July 2	July 9	July 16	July 23	July 30	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	73,865	77,659	64,399	74,255	74,799	68,648	76,128	70,740	75,967	74,366	30	2,372,960	+ 127,308
Calcutta ... ... Rs.	96,136	102,112	102,598	93,166	95,784	94,070	96,389	98,562	95,614	91,072	33	2,323,363	− 492,029
Madras... ... ... Rs.	46,311	(2 weeks)	54,312	(2 weeks)	53,467	46,115	(2 weeks)	50,763	(2 weeks)	48,418	30	539,350	− 142,603
Pernambuco	6,042	5,810	5,997	5,723	5,698	2,742	2,492	2,771	2,913	3,158	30½	114,739	− 103,323

Companies Issuing Monthly Statements only.

	1920.						1921.						Wks.	AGGREGATE.	
	Feb.	Mar.	April	May	June	July	Feb.	Mar.	April	May	June	July		1921.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	4,279	4,182	4,933	3,673	3,672	...	4,700	4,934	5,120	4,570	4,134	...	12	13,824	+ 1,546
Brazilian Trac. Mts	9381,000	9900,000	10245000	1098500	10874000	...	11941000	13102000	13562000	14462000	14257000	...	26	80,199,000	+19159000
British Columbia $	746,030	761,182	749,081	720,004	710,210	...	792,590	816,452	791,688	774,523	750,907	...	52	9,504,071	+ 766,939
Buenos Ayres L'e'z.	52,468	55,000	53,429	54,563	50,635	51,508	53,952	59,365	60,238	58,492	51,071	51,944	4	51,944	+ 436
Burma	...	45,117	44,673	46,783	50,471	...	...	50,930	50,159	48,353	54,275	...	48	561,613	+ 61,946
Cape Town ...	...	...	...	24,395	...	...	...	...	27,662	27,407	25,038	...	—	—	—
Carthagena & H. ...	4,008	3,493	5,482	5,313	5,562	4,164	2,839	2,226	2,329	1,602	1,410	1,936	30	16,219	− 16,551
Cordoba	16,915	18,522	...	...	...	...	18,600	21,736	...	...	...	...	52	237,522	+ 36,887
East India ...	3,001	3,592	3,916	3,980	3,862	4,081	3,819	4,168	4,560	4,392	4,078	4,591	52	51,464	+ 11,972
Kalgoorlie	2,677	3,142	3,246	...	...	...	*316	2,485	2,398	...	...	...	17	7,617	− 4,021
La Plata	5,892	6,392	6,142	...	...	5,353	*727	3,404	5,878	...	...	5,425	30	33,317	− 5,180
Lima	56,162	...	...	...	...	...	60,718	...	...	...	...	...	8	124,329	+ 9,593
Manila ... $	278,437	263,690	254,103	261,803	267,169	...	306,389	298,317	279,535	293,873	310,559	...	26	1,810,051	+ 207,981
Monte Video ...	45,259	...	...	42,401	39,989	39,647	48,119	...	...	46,579	42,960	42,411	39	418,827	+ 31,892
Para	24,292	24,872	24,760	25,831	25,392	...	22,596	24,240	24,340	24,755	24,884	...	30	169,299	− 4,566
Port Elizabeth ...	...	...	...	6,165	...	...	...	...	7,082	6,304	6,180	...	—	—	—
Rangoon ... Rs.	115,000	130,470	117,860	119,000	117,735	...	120,718	158,121	125,163	138,950	130,000	...	26	795,540	+ 83,445
Toronto ... $	1113,717	1255,668	1211,708	1206,930	1127,239	...	1228,722	1318,273	1259,933	1271,306	1295,701	...	26	7,648,186	+ 602,438
Winnipeg ... $	444.873	456,915	431,685	404,742	407,625	...	460.125	495.208	462.378	433.836	432.894	...	26	2,790.670	+ 145.993

* Strike of employees.

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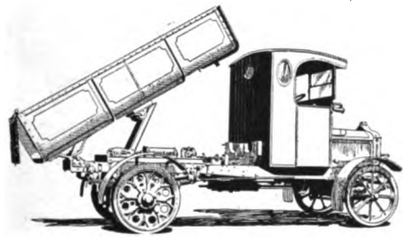

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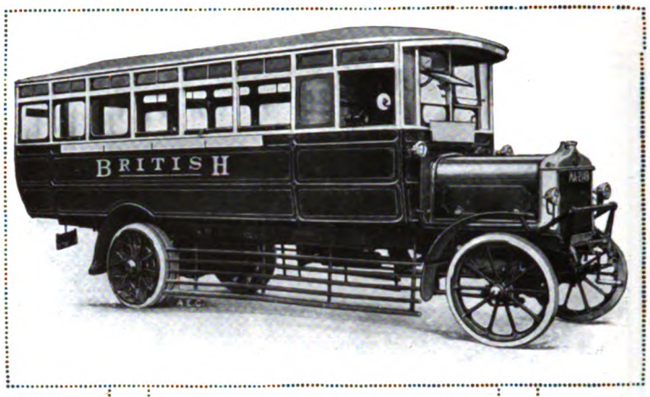

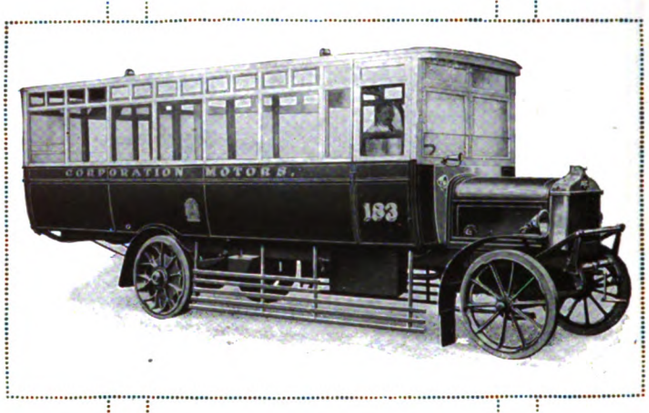

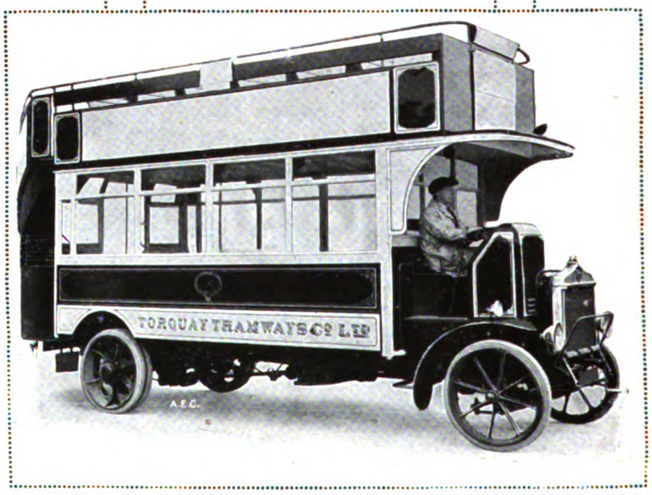

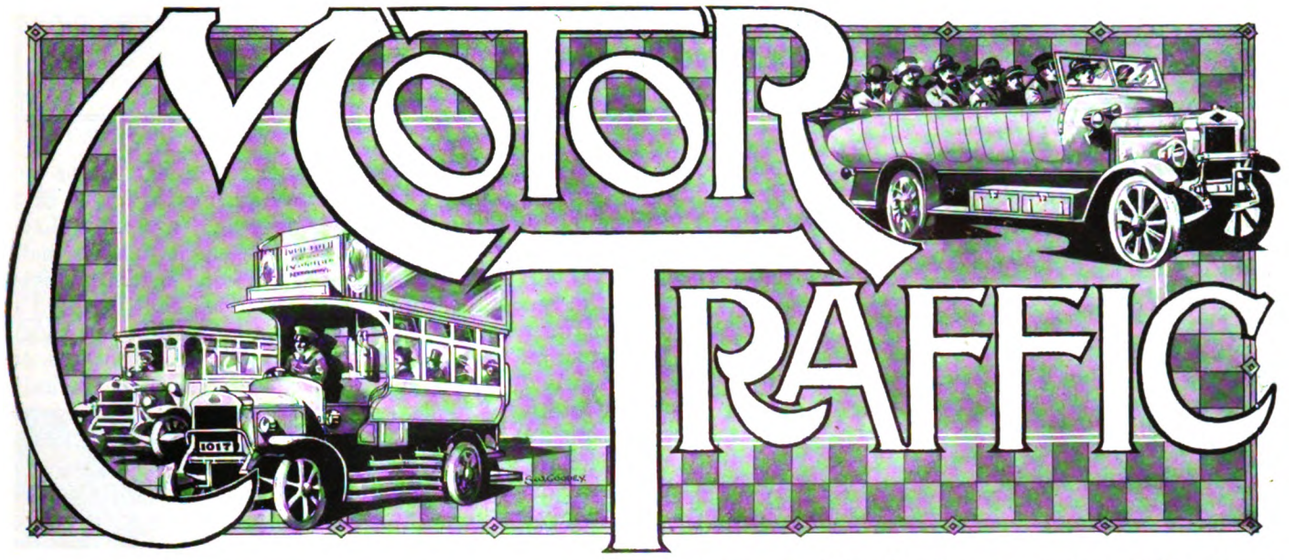

RAILWAYS AND THE ROADS.

For the moment, the motor carrying trade is relieved of the threat underlying the proposal of the railways that they shall be granted full powers for the running of motor transport services. It must be remembered, however, that Parliament has not given a decision on the matter of principle and all that has happened is that the Speaker has ruled that the subject cannot be dealt with under the present Bill. This means that, while the possibility of unrestricted use of roads by the railways is rendered rather more remote, it none the less continues to exist. The position is, from the motor manufacturer's and user's point of view, an unfortunate one. It would have been better had the matter been definitely decided one way or the other. As things are, the railways are not in a position to place increased orders for motor vehicles with a view to the establishment of new services, while independent motor carriers are likely to be very cautious in respect of enlargement of the facilities offered by them until they know just how they are likely to stand in a few years' time. Unfortunately, it is impossible to bring home to the public and to Parliament the danger of accepting the railways' proposals without at the same time rendering the independent carrier somewhat nervous as to the future and therefore cautious as to his investments. From the motor industry's standpoint, it is highly probable, if not certain, that when a Bill is introduced on this specific subject, it will be possible to secure the inclusion of a clause preventing the railways from becoming motor manufacturers. This, however, is not the main ultimate point. The fear is that though the railways, to develop road services, might place considerable orders for motor vehicles in the first instance, their policy might be in the main directed towards driving traffic back to the railways by killing external competition on the roads, and then removing or reducing their own motor services. If this policy were adopted, road transport would receive a very severe set-back and the manufacturers of motor vehicles would suffer accordingly. It remains to be seen whether any scheme can be devised which would absolutely safeguard the public against the procedure suggested above. If equitable competition between the railways and the independent road carriers were possible and could be ensured, much of the opposition to the granting of increased powers would be removed. The road carriers would still naturally fight their own battle but the motor manufacturer could hardly be expected to object to an arrangement which would compel two groups to provide improved road services, purchasing their vehicles for the purpose from the manufacturing industry. The difficulty appears to be that, if the railways are permitted to compete freely, they must compete at a marked advantage, enabling them to drive their competitors off the road; this for the reason that such large corporations can buy vehicles and supplies at rock bottom prices and can afford to cut their profits down to a minimum or even to work at a loss for a long period. To them the road service is merely subsidiary. To the road carrier its financial soundness as a direct profit making proposition is vital. The railways might well maintain that certain services were run by them at a loss, but with legitimate commercial objects, because those services brought additional business to the railways and the result of their existence could, therefore, be shown in the railways balance sheet to be beneficial. One point at least is clear, which is that the road transport organisations that have hitherto been endeavouring to organise public opinion against the railways' proposals must not now rest upon their oars and imagine that they have won a victory. Should they do so, they will presently find public opinion veering round as a result of propaganda inspired by the railways, and this change of opinion will be followed by the introduction and passage of a special Bill in Parliament.

VEHICLE WEIGHTS AND SPEEDS.

A couple of months ago reference was made in these notes to the possibility that the law of the future as regards commercial vehicle weights and speeds would represent a definite attempt to compel the use of exceptionally large wheels, with the alternative of being penalised severely in respect of speed and, therefore, of economy. Not only would such a law impede progress towards the fullest possible economy in road transport, but it would also interfere with the natural progress of vehicle design and render existing types hopelessly inefficient, assuming the law to be kept. In practice, complicated regulations would almost certainly mean regulations that would not be observed. Any attempt to enforce them exactly would involve the constant employment of large number of police officers in stopping vehicles in order to ascertain axle weights, unladen weights and wheel diameters. We need not, however, labour the matter

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MOTOR TRAFFIC

any further, since, at the time of writing, it is understood that the representations made by the manufacturing industry have had their effect and that the Ministry now proposes to disregard wheel diameter as affecting speed and merely to safeguard the road by laying down limits below which wheel diameters must not be reduced.

REQUIREMENTS OF OVERSEAS MARKETS.

A very interesting conference organised by the *Motor Export Trader* has recently been held in London. This conference afforded the first real opportunity for general discussion between motor manufacturers and retail motor traders from various parts of the world. Overseas interests were well represented and the large attendance of manufacturers afforded evidence of the great interest which the British industry now takes in the development of its overseas markets. The overseas traders had a large number of suggestions to make, and many of these were formulated at a special meeting held after the conference. Very strong exception was taken to the underlying principle of the present system of taxation of private cars. This, it was pointed out, has the effect of encouraging designers to reduce engine dimensions to a minimum. The result is too often the production of a vehicle reasonably suited to home requirements, but with an insufficient margin of power to be pleasant to drive in countries where the road system is more primitive. It is difficult enough in any case for the manufacturer to satisfy at one the requirements of the British and of the Overseas markets, and it is certainly very regrettable that his difficulties should be accentuated artificially by the adoption of an arbitrary scheme of taxation.

Another and quite different point, equally strongly emphasised, was a complaint to the effect that British vehicles are very commonly exported equipped with tires of insufficient section. These tires give trouble almost immediately and the result is that the reputation of the tire manufacturer suffers and that, perhaps, of the vehicle manufacturer also, it being often assumed that rapid tire wear must be due to a fierce clutch or a badly designed or constructed transmission system. In point of fact, our visitors were complimentary as to the strength and efficiency of the transmission systems of British commercial vehicles, attributing their durability and satisfactory service largely to this cause, coupled with the employment of thoroughly substantial back axles.

LIGHT VANS.

The main criticism in respect of trade vehicles appears to be that, on the whole, the British industry does not cater sufficiently for would-be users of the lighter type of motor van built to run on pneumatic tires and to carry up to about 25 cwt. of useful load. The demand is for something rather more substantial than a touring car chassis with a van body, but less on the lines of the conventional trade vehicles than the usual type of 30 cwt. van. In the opinion of the writer, the number of light American chassis in use under trade bodies is strong evidence in favour of the contention that the British manufacturer does not quite cover the field. It should not be necessary for these light vans to be obtainable at exceptionally low first cost. The owner of a substantial business would be, presumably, prepared to pay a higher price in the first instance in return for greater durability and reliability. Some of our overseas visitors suggested that in their markets it should be possible for a good British vehicle of the type indicated to realise a price about two and a half times as great as the cheapest forms of light van on foreign chassis. The case is different from that of the private motorist who may be compelled to limit his initial expenditure, even though, by so doing he effects no real economy, because his operating costs are inflated. The trader must consider his profits over a period of years and organise with a view to ultimate economy rather than to an immediate saving. The extended use of pneumatic tires of very large section should act as an incentive to the design and construction of a van of the type indicated, and the demand for a good machine of the sort, marketable at a reasonable but not at an exceptionally low price, should be very considerable.

OVERSEAS MOTOR TRADE.

CONFERENCE WITH DELEGATES IN LONDON.

The first Overseas Motor Trade Conference organised by the *Motor Export Trader* took place at the Hotel Cecil, London, on July 21, Mr. W. A. Standring presiding, and Mr. H. C. B. Underdown occupying the vice-chair.

Sir P. LLOYD-GREAME, Parliamentary Secretary to the Department of Overseas Trade, expressed the opinion that the conference would have a double value. It would enable manufacturers to pool their experiences and engage in a frank interchange of views on common problems. Its value also became immeasurably greater when it extended to a frank interchange of views between the manufacturers in this country and the representatives of those markets with whom they hoped to do greater trade in the future. While this country had greatly increased its productive capacity, the returns showed that the import of motors into Great Britain had increased at a far greater rate than the exports of motor vehicles had done. He had made some inquiries as to British motor vehicles in the Dominions, and he found that for one British car there were thirty foreign cars. That figure was not nearly good enough for the British motor trade. (Hear, hear.) Another suggestion he would like to throw out was the consideration of design and manufacture for the Empire markets and those of countries with similar conditions to our own. The Dominions wanted to buy British motors, so long, of course, as the price was what they could pay. It was for this country to bring price and design and workmanship into relation with the demand.

Major R. E. GODDARD remarked that the public overseas stated that British prices were too high. That was both true and not true—it was true if the lasting value and commercial running were not considered in relation to initial cost. In some territories higher clearance and more cooling capacity were desirable, but generally speaking the British vehicle was capable of negotiating most roads, or so-called roads, as well as the average foreign vehicle. He thought a standardised wheel-track of 4 ft. 8 in. was desirable. In the matter of commercial vehicles he considered this country well held its own. A great deal more push and educative propaganda was needed, however, all round. The speaker added the suggestion that representatives of British manufacturers going abroad should call upon the various Commercial Counsellors and Trade Commissioners, and make more use of the facilities offered by the Overseas Trade Department.

As a result of discussion it was decided to convene a private conference of the Overseas delegates to consider problems of gearing, of cooling radiators, and of adequate hoods and screens to meet Dominion conditions.

AMENDMENT OF WEIGHT REGULATION.—An order has been issued by the Ministry of Transport increasing the maximum weight of a motor car (unladen) using the highways to 7¼ tons, and in the case of a motor car and trailer (unladen) to 9¾ tons.

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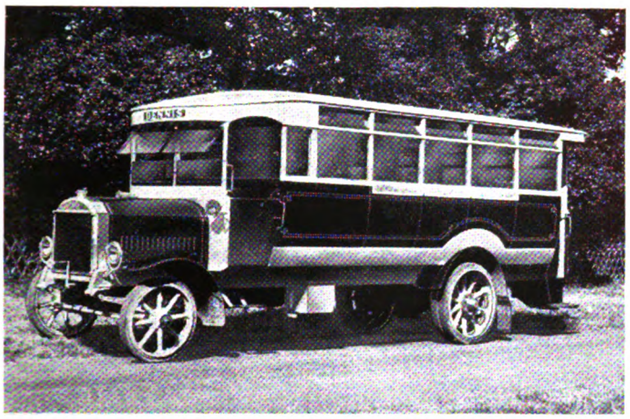
MOTOR TRAFFIC

DENNIS 36-SEAT OMNIBUS.

An illustration of the latest type of single-deck omnibus produced at the Guildford Works of Dennis Brothers, Limited, is given on this page. The vehicle has seats for 36 passengers, and although this is the maximum number that can be conveniently seated in a single saloon, the body has not the cumbersome appearance sometimes seen in the overhang of the rear of bodies of that capacity. Messrs. Dennis claim for this 40-50 H.P. chassis and body that they



Latest Type of Dennis Omnibus.

are as near perfection as engineering skill can make them. If satisfaction with previous models of both single and double deck omnibuses by users can be regarded as a criterion, the new vehicle should be in great demand by municipal, company, and private operators. It is important to note that the same chassis is suitable for the firm's double-deck omnibuses designed to carry 56 passengers.

Chassis Features.

The 40-50 H.P. is developed from four cylinders, cast in pairs, bore and stroke 115 by 150 m/m. The inlet and exhaust ports are placed on opposite sides. The valves are silently operated and entirely closed. Valve tappets are silent and adjustable. Water circulation is by centrifugal pump placed in an accessible position. Accessibility is a characteristic of the arrangement of the magneto, oil pump, carburetter, and fan drive. The lower half of crank case can be easily dismounted without disturbing any of the working parts of the engine.

The engine can be accelerated to attain a speed of 20 miles per hour, and will climb a gradient of 1 in 6 when fully loaded, the fourth speed provides a direct drive. The gears are changed by a single lever working in a "gate" simple in design and easy of operation.

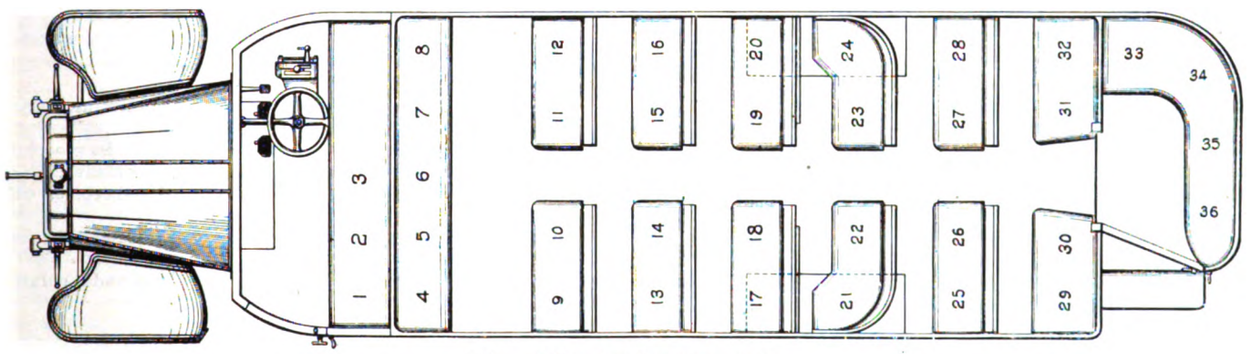
The gear-box casing is a special metal casting fitted with a large cover giving maximum opening, and a smaller cover quickly detachable for the introduction of lubricant. The gear shafts run on ball bearings, the gears are of chrome nickel steel, and are of such width and pitch as to assure long service. The shafts are splined, and are of large diameter.

An under-shield of non-rusting sheet steel extends from the engine to the back of the gear box, effectively protecting these parts from mud and dust.

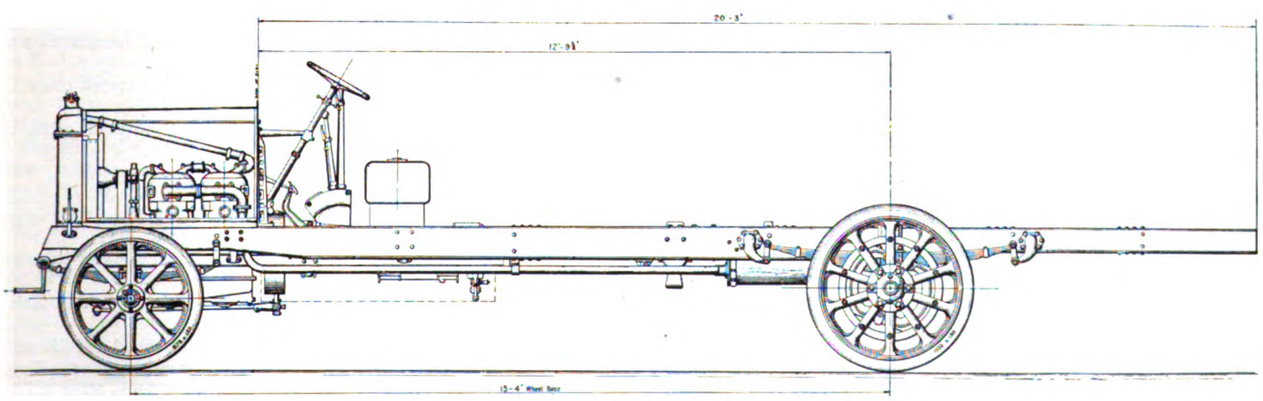
The dimensions of the chassis are—Length over all, 25 ft.; width over all, 7 ft.; dash to end of frame, 20 ft. 3 in.; dash to centre of back axle, 12 ft. 9¾ in.; width of frame, 38¼ in.; height of frame, 35⅛ in. loaded; wheel base, 15 ft. 4 in.; wheel track, 5 ft. 6 in. The weight is approximately 3 tons 4 cwt. The ground clearance is 11½ in. The turning circle of vehicle is 50 ft.

Another feature is that the road springs are of special design, and constructed specially for passenger carrying work, of ample length and flexibility, thus assuring absence of road shocks when travelling over rough and uneven surfaces.

Accessibility of every part is most marked, and it is well shown by the design of the rear axle. This is contained in a steel casing which carries the weight of the vehicle. The power is transmitted to it through special high efficiency Dennis worm gearing. The top cover of the steel casing is easily removable without taking down the axle or the wheels. When removed it carries with it the worm



Plan of Seating Arrangement.



Elevation of Chassis.

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MOTOR TRAFFIC

and wheel and the differential gear. The live axles themselves can be easily withdrawn without removing the wheels or jacking up the chassis. An oil filler is fitted in an accessible position at the back of the axle casing, and enables the oil level to be easily ascertained. The rear wheels run on hardened and ground bearings, which are fitted with gun-metal floating bushes.

Cooling water is circulated by a centrifugal pump of large dimensions. Lubricating oil is forced to the working parts of the engine by a pump. A large oil sump at the bottom of the crank case carries a sufficient supply of oil for 5,000 miles.

Ample brake power is provided. The foot-brake is of the contracting type of large diameter, and has ample area of wearing surface, very accessible, and easy adjustment. The hand-brakes are of the expanding type and are compensated. They are operated by the movement of cams, and are adjustable for wear by means of large adjusting nuts in an accessible position.

Body Details.

The framing of the body is of dry English ash of best quality, framed together and reinforced with light steel castings. The necessity of using heavy iron castings for strengthening is eliminated by pillars being jointed directly into cross members. The panels are of 22-gauge C.R. and C.A. steel, butt-jointed to pillars, the joints being covered with aluminium mouldings. The interior is lined with best quality birch, ply-butted between all pillars. The flooring is of ¾ in. yellow deal, tongued and grooved, and provided with the necessary trap doors in suitable positions for giving easy access to gear-box, back axle, etc.

Communication between driver and conductor is by means of a gong fitted over driver's seat and operated from the back platform. The trimming is of best quality Rexine leather cloth, and "flex edge" spring cushions. Windows are glazed with 32 oz. sheet glass. Ventilators are fitted around the top, sides, and front of body, each pivoted tightly and fixed to frame. The upper part of the windscreen is divided into two, each portion is made to open on quadrants, and is glazed with $\frac{3}{16}$ in. polished plate-glass The whole of the body and chassis is painted and finished in the best style.

L.G.O.C. TRAFFIC CONTROL.

A Triumph of Organisation.

Apart from the excellent work of the drivers, conductors, and regulators during the August Bank Holiday period, great credit is due to the organisation for traffic control by telephone built up by Mr. H. Wood, who has headquarters over the Leicester Square tube station. In this work he has the co-operation of Mr. G. P. Barnett (road superintendent) and Mr. H. Lansdown (traffic superintendent). It is claimed that by means of this central control the organisation can move without undue delay 4,000,000 passengers within fifteen hours to and from a radius of thirty miles of London. The control office is open day and night, and the work there accomplished has been watched with interest by experts from other countries.

The system of control was inaugurated about six years ago, and has been evolved out of experience. It has been developed on the basis of practical working in carrying London's millions. The chief factors in the organisation are the use of the telephone and the exercise of vigilance on the part of the road staff in sending reports as to the weather and the number of passengers waiting at traffic points. In the controller's office weather forecasts are received from the Meteorological Office, and by means of an electrical apparatus connected with a wind vane on the top of the building the controller can learn in his office the direction of the wind.

The company has a new system of telephones under construction to enable the road inspectors to send their messages more quickly than can be done by the use of the post-office telephone. For the work of control the London and country area is divided into seven divisions, each in charge of a superintendent, and again sub-divided into fourteen sections, under an assistant superintendent. By means of their reports the controller is enabled to divert omnibuses to the points where they are most required. On the country routes at week-ends and at holiday periods the organisation aims at leaving no passenger stranded through not being able to find room in the "last omnibus."

The controller entered the service of the L.G.O.C. in 1898 as a conductor, and he has worked as a driver, ticket inspector, road inspector, etc.

LONDON TRAFFIC REGULATION SCHEME.

Proposals before the Ministry of Transport.

In the House of Commons, on July 11, Sir E. Geddes, Minister of Transport, in reply to Sir F. Hall, said a committee of members representing London constituencies had made valuable suggestions to him with reference to the London traffic problem.

As already reported in this journal, the proposals were drawn up by a sub-committee of London members, consisting of Mr. J. D. Gilbert (chairman), Viscount Curzon, Sir William Bull, and Mr. H. G. Purchase. They were approved by the full body of representatives of metropolitan constituencies, and the Ministry of Transport is now consulting local authorities in regard to them. The proposals, which have been embodied in a draft Bill, include the setting up of a Committee to advise the Ministry on control of traffic, regulations relating to vehicles of special descriptions, obstructions to traffic, and penalties. The Committee would consist of two London Members of Parliament, one representative of the London County Council, one representative of the Borough Councils, one representative of the Greater London authorities in the metropolitan police area.

It is proposed that, after consultation with the advisory committee, the Ministry should publish a new set of by-laws and regulations. The scheme provides that there should be a public inquiry, and that after approval by the Government departments concerned, the by-laws should be enforced.

Scope of the By-laws and Regulations.

As regards control of traffic, the scheme empowers the Ministry to make by-laws and regulations prescribing –

1. The routes to be followed by all or any particular class or classes of traffic or vehicles between any specified points.
2. Streets which are not to be used by traffic or vehicles of any specified class or classes, either generally or at specified times.
3. The speed of vehicles or of any class or classes of vehicles, and the relative positions in the roadway of traffic of differing speeds or types.
4. Places where and the conditions under which vehicles may turn in order to proceed in the opposite direction.
5. Conditions subject to which articles of unusual weight or dimensions may be carried by road, or loaded or unloaded.
6. The conditions subject to which sanitary vehicles or vehicles delivering goods or merchandise of any special class or classes may stand in streets or any specified streets.
7. Conditions subject to which house and street refuse may be collected.
8. The precedence to be observed as between vehicles proceeding in the same direction, or in opposite directions, or crossing.
9. Conditions subject to which horses, cattle, sheep, or other animals may be led or driven.
10. The traffic notice to be exhibited and the form and character of such notices.

It is next proposed that there should be by-laws and regulations to deal with—

1. Waiting vehicles.
2. Vehicles used for advertisement purposes.
3. Broken-down vehicles.
4. Unsound vehicles likely to break down.
5. Unattended vehicles.
6. Cab ranks, and ranks and stopping-places of omnibuses and other public vehicles.
7. Cabs when not hired and being elsewhere in a street than on a cab rank.

Obstructions to traffic, it is contemplated, will be dealt with by by-laws with respect to—

1. Lighting and guarding of street works.
2. Marking and lighting of bridges.
3. Provision of sufficient head room in new bridges and the proper lighting of structures with insufficient head room.
4. The erection or placing of any works or objects likely to cause an impediment to the free circulation of traffic.
5. Queues of persons waiting for public vehicles or admission to places of entertainment.

Penalties for infringement of the regulations are fixed as follows—First offence, fine not exceeding £20; second or subsequent offence fine not exceeding £50. The continuance of an offence after a conviction would render the offender liable to a fine of £5 per day.

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TRAMCAR AND OMNIBUS THROUGH BOOKINGS.

EXTENSION OF LONDON SCHEME.

A large extension of the through booking scheme inaugurated between the London County Council Tramways and the London General Omnibus Company in February last came into operation on July 20. The full list is as follows—Tramcar to Charing Cross (Embankment)—Omnibus to Piccadilly Circus, Bond Street (Oxford Street), Tottenham Court Road (Oxford Street), Euston Road (tram terminus). Tramcar to Victoria—Omnibus to Edgware Road Station (Bakerloo). Tramcar to Euston Road—Omnibus to Baker Street, Bridge Street, Westminster, Oxford Circus, Cambridge Circus, Kingsway, Charing Cross (Embankment), Victoria, Paddington Station (Bakerloo), Marble Arch, St. George's Hospital. Tramcar to Holborn—Omnibus to Blackfriars Station. Tramcar to Moorgate—Omnibus to Southwark Bridge (tram terminus). Tramcar to Southwark Bridge—Omnibus to Moorgate (tram terminus). The L.G.O.C. retain or receive 1½d. in respect of the first 1½d. local journey on the omnibuses, and thereafter a further 1d. for each two additional sections. The only exception to this is in the case of the bookings *via* Charing Cross (Embankment) to Bond Street (Oxford Street). The local omnibus fare for this journey would be 3d., but as this distance would not be the whole of the 3d. stage, the company agreed to accept 2d. in respect of through passengers, the Council thus retaining the whole of the ordinary tramway fare.

At the meeting of the L.C.C. on July 5, the Highways Committee recommended that the 2d. mid-day fare at present in force on the Council's tramways should be put into operation on the combined London and Leyton tramways. At that time on through-running routes *via* Lea Bridge Road the 2d. mid-day fare operated only to the county boundary at the River Lea. An extension of the 2d. fare to the Bakers' Arms, Leyton, would, it was stated, involve a total distance of 7½ miles on the longest through route *via* Lea Bridge Road. A portion of the Leyton tramways extending into Epping Forest was, so far as the Lea Bridge route services were concerned, used only on Saturday afternoons and Sundays, whereas it was thought that new weekday traffic would be encouraged if a certain number of cars were run from London into Epping Forest at the cheap mid-day fare. The greatest distance a passenger would be able to travel on this would be 8½ miles, as compared with over 13 miles between the Embankment and Abbey Wood. There were also through services between Leyton and West Ham on which the 2d. mid-day fare might be applied over a section of the tramways within Leyton and subsequently extended if the West Ham Corporation agreed. The Highways Committee's proposal was adopted.

OMNIBUS REGULATIONS IN CONNECTICUT.

A law which took effect in the State of Connecticut on July 15 brings jitneys, as omnibuses are termed, under the law as common carriers, and subjects them to the jurisdiction of the Public Utilities Commission of the State. The Act provides that no one shall run an omnibus until the owner has obtained a certificate from the Commission, and under this law proposed omnibus routes may be established upon proof of their convenience and necessity. During June several hundred cases were considered by the Commission. In giving its first decision in an application under the Act, the Commission has outlined its policy. Some of the controlling principles may be briefly summarised—

(1) The general public good and the public requirements are to be considered rather than individual convenience.

(2) Essentiality of existing tramways.

(3) Stability and continuity of existing services.

(4) Protection of existing concessions from unreasonable competition.

The jitneys will be required to fulfil certain operative conditions. Their owners must maintain prescribed schedules, and post in a conspicuous place inside of each car a time table of the entire services together with the rates of fares. These services cannot be reduced without the approval of the Commission, and deviations from the specified routes will not be allowed except in cases of emergency. The omnibuses are to be run only at a speed consistent with safety, which will, of course, depend on the conditions of general street traffic. In suburban services speeds may be greater than in suburban districts, but must not exceed 20 miles per hour for a vehicle having a seating capacity of ten or more persons, or more than 30 miles per hour in the case of all other vehicles. All vehicles must be equipped with a speed indicator. Operators are not allowed to solicit passengers by outcry or other noise, nor may an operator collect fares, or take up or discharge passengers while the vehicle is in motion.

Commenting on these conditions, the *Electric Railway Journal*, of New York, says that when a Public Commission stands for such a policy as this, the owners of street railways need have no reason for anxiety. They will not be subjected to unfair or unreasonable competition, because their importance as essential public utilities is clearly recognised. At the same time the Commission places upon them an added responsibility to see that the reasonable requirements of the public are met as far as possible.

LONDON OMNIBUS ENTERPRISE.

EXTENSION OF THE COUNTRY SERVICES CARRYING OVER ONE MILLION PASSENGERS WEEKLY.

The first half of the year 1921 will be memorable in the annals of the London General Omnibus Company and its associated omnibus companies because of the fact that the undertakings have reached a stage of activity which far exceeds in convenience to the public the facilities available before the war. For two and a half years the L.G.O.C., in conjunction with the Associated Equipment Company at Walthamstow, have been engaged in bringing up their fleet to pre-war strength. Many hundreds of the old B type of vehicle, which achieved such good service in the war area, have been replaced with the new K omnibus and the still later, lighter, and more commodious S pattern.

Such great progress had been made by the August Bank Holiday that the pre-war strength had been attained, 2,830 vehicles being placed on the road, ready to carry during the three days of the vacation 12,000,000 passengers for town and rural trips. This achievement constitutes the highest testimonial that could be desired for the facilities available at the Walthamstow works of the A.E.C., for that great undertaking, in addition to supplying the needs of the L.G.O.C., has been busily engaged in meeting the demand for omnibuses and lorries from all parts of the United Kingdom. Another important step taken by the L.G.O.C. is to be seen in the opening of the commodious central repair depot at Ealing. The work carried on there has the effect of keeping vehicles longer in service, besides lessening the period of overhaul.

During the third week in July the company not only provided vehicles for linking up with the tramway services of the London County Council at six points, but placed an additional seventy omnibuses at rush hours on congested routes throughout London. The effect of this has been a more rapid clearing of busy points during the evening.

On July 18 steps were taken to make good the deficiency of travelling facilities due to the withdrawal of trains on the Underground Electric Railways between midnight and 1 a.m. This curtailment was necessitated by the earlier hours kept in the West End, due to the restrictions on licensed premises and the depression in trade. The Underground Group have announced that when the public requirements demand it the late trains will be restored, but meanwhile the omnibus company would provide late services.

THE POPULARITY OF COUNTRY ROUTES.

It is only a few years ago since the L.G.O.C. started country services by bringing St. Albans, thirty miles distant, into connection with the Metropolis. The object was to test the public feeling towards a rural service. The experiment proved so popular that there are now facilities for reaching towns from thirty to forty miles distant on three sides of the capital. The longest trip was instituted early this summer to Guildford. On the majority of these long distance runs there are now services at from thirty to twenty minutes' interval. An important consideration is that at Redhill, Westerham, Reigate, and Godstone the services link with those of the East Surrey Traction Company, thus enabling passengers who do not mind a long journey to travel to Brighton. The East Surrey vehicles connect with those of the Southdown Company for Brighton at Handcross. In the south-east it is also possible to journey by other companies' omnibuses to Maidstone, Canterbury, and the Kent seaside towns.

The East Surrey Company are deriving so much traffic from the London connections that they are on the point of putting on other services which will link with the L.G.O.C. vehicles.

Since July 20 the L.G.O.C. have operated numerous new country routes.

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ROAD TRAFFIC POWERS.

PRESENT DECISION AGAINST THE RAILWAY COMPANIES.

The climax to several weeks of propaganda on the part of both the railway companies and motor transport industry was reached in the House of Commons on July 27, when the Railways Bill was considered on report.

Sir W. JOYNSON-HICKS asked for the Speaker's ruling with regard to a new clause empowering railway companies to own road vehicles practically throughout the country. He suggested that this was entirely outside the scope of the Bill. He quoted the ruling in 1916 of the then Chairman of Committees (Mr. Whitley) on the point.

Major HILLS, who submitted that the new clause was quite in order, said that for years railway companies had carried on certain businesses ancillary to their railways, and this Bill included them. They included docks, hotels, and steamships. Then at the present time certain railways ran road vehicles under powers already conferred upon them.

The SPEAKER thought the ruling given by the Chairman of Committees in 1916 was a very sound one. (Laughter.) He thought therefore that Sir W. Joynson-Hicks's contention was right. This Bill was not a Bill to confer new powers on railways—its scope was the regulation of railways. Therefore he was of opinion that the proposal in the clause in question was a matter for separate legislation.

Major HAMILTON said four railway companies had already got these powers, and it was desirable that they should be conferred upon all. These four railways belonged to the northern and eastern groups, the southern and western groups including no railways with these powers. The new clause sought to make all the railways equal.

Major HILLS suggested that the Bill was not one merely for regulating railways. Power to increase charges and so on were given.

The SPEAKER said he had carefully considered the points raised. Certain powers had been obtained by certain railways by private bill legislation, but when the proceedings in connection with that legislation took place all the parties interested had the opportunity of being heard. He could not see anything in connection with the cases mentioned to induce him to alter his ruling.

Speaking on the same day at the annual meeting of the Automobile Association, Sir W. JOYNSON-HICKS, with reference to the application of the railways for road powers, said that if the Bill were passed, although it did not affect them as individual motorists, it would enormously affect others, including the carrying companies associated with them, and there would be terrific competition. There would be fleets of railway vehicles and fleets of privately owned vehicles, all of them doing real damage to the roads.

Mr. R. S. TILLING, chairman of the London and Provincial Omnibus Owners' Association, states that for the present the withdrawal of the clause has put an end to the crying injustice that was about to be perpetrated. The effect of passing the clause would be to crush out the little man and the creation of a gigantic monopoly.

A prominent railway official has stated that an effort will be made next year to obtain legislation giving the required powers.

C.M.U.A. EXAMINATIONS.

The oral, written, and practical examinations instituted for drivers of petrol and steam vehicles by the Commercial Motor Users' Association in 1907 were this year extended to the various divisions of the Association, while at the same time the national championships were continued. The Association announce that the national championships (written and practical tests) were awarded as appended—

National Champion Petrol Driver.—£10, diploma, and medal—R. J. Spurrier. (Employer, E. Nelson and Company, Limited.) £5, diploma, and medal—W. J. Denyer. (Employer, Gas, Light and Coke Company.)

National Champion Steam Driver.—£10, diploma, and medal—F. Upchurch. (Employer, Sun Flour Mills Company, Limited.) £5, diploma, and medal—F. G. Mobbs. (Employer, Sun Flour Mills Company, Limited.)

Awards have also been made in four divisions of the country. In the West of England six employees of the Bristol Tramways and Carriage Company took prizes, the second award for petrol drivers going to L. Sullivan, one of the company's employees.

COACHES MEET WITH COMPETITION.

RAILWAYS OPEN A NEW ERA BY REDUCING FARES.

With the advent of July and the approach of freedom from Government control on August 15, the railway companies returned to cheap fares, thus setting up some obstacle to the entire freedom from competition enjoyed by motor coach proprietors since the revival of their traffic after the war. Fares, of course, have not fallen to the low rate prevalent prior to the war, but the reduction has been sufficient to cause a decrease in many coach fares also, particularly for vehicles running from London and provincial centres to seaside resorts. The railway companies, in the words of one of their officials, recognise that it is more profitable to fill their trains at cheaper fares than to run them half empty at high fares. The year 1913, observes the same authority, when the companies created records in cheap travelling facilities, was the most profitable in their history.

Various coach companies report that there has been no falling off in the eagerness of the public to use their conveyances, and since the end of June there have been numerous additions to the vehicles operating from London and the great towns. Apart from those put on for the record traffic to Goodwood Races there have been many machines added to services running to the Sussex, Kentish, Essex, Suffolk and Norfolk coasts. Thus the Samuelson Transport Company early in July had more than one hundred coaches on the road. This company, which shows the lead in the use of advertising, has come rapidly to the front, and on successive Saturdays they have had a thousand more applicants for seats than could be provided for. The company have made arrangements to erect the first large coaching station in the Metropolis. On a site off the top of Drury Lane, once occupied by the White Hart Inn, the starting place of the old stage coaches, a building is to be erected which will have three platforms, each giving accommodation for 28 coaches.

An addition to the London General Omnibus Company's coach trips was inaugurated on July 21, and will continue on Wednesdays and Thursdays. It is an evening run to Kingston, Hampton Court, and Bushey Park, returning *via* Twickenham, Richmond, and Kew to St. James' Park Underground Station.

USE OF COACHES IN THE WINTER.

It is a practice among small owners for coaches to have their bodies removed and a lorry body substituted for goods haulage during the off season. The Samuelson Company intend to adopt the same plan with many of their vehicles. Mr. Samuelson states that the mileage cost of running a coach is about the same as that of a railway, but the cost of handling freight by coach is much cheaper, as it can be delivered direct to its destination, whereas in the case of a railway it has to be handled more than once. The Cambrian Company, another London undertaking, is considering the question of using their fifty coaches in the same manner. At present they are investigating the question whether the conversion would impair the usefulness of the chassis for passenger traffic afterwards.

SCOTTISH RAILWAYS FORBID PASSAGE OVER BRIDGES.

Railway companies in Scotland have forbidden coach owners to use a number of their bridges, notably the Connel Ferry Bridge at Oban, which is on the route of Scotch tours Consequently to visit Oban the coaches have to make a detour of seventy miles. The Caledonian Railway Company, after prolonged negotiations, have informed the Samuelson Transport Company that no coaches will be allowed to use the bridge. The reason given is that the vehicles are "taking the bread and butter out of the railway companies' mouths."

PRAISE FOR DRIVERS.

A feature of the present coaching season is the commendation bestowed upon coach drivers by writers of letters to local newspapers. The great majority of the men are ex-army drivers, and now that they have had experience of driving on home roads they may be classed with the best private motorists for their observance of the rules and courtesies of the road. Speaking with experience of several journeys on narrow Essex roads in the coaches of the National Omnibus and Transport Company (which was founded by Mr. Clarkson, and has Mr. Iden, the former engineer of the London General Omnibus Company as managing director), we can state that the drivers showed the greatest consideration for other vehicles. Evidently they have been well trained in the principles of "Safety First."

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OMNIBUS SERVICES.

TODMORDEN.—The Corporation have obtained sanction to borrow £2,000 for their omnibus undertaking.

BOURNEMOUTH.—The Tramways Committee have instructed the manager to arrange for a temporary omnibus service on weekdays and Sundays.

PLYMOUTH.—Sir Thomas Baker reported to the Corporation on July 26 that during the preceding three months there was a net profit on the omnibuses of £295.

BURTON-ON-TRENT.—The Corporation have granted two omnibus licences to the Trent Motor Traction Company, and seven to the Birmingham and Midland Motor Omnibus Company.

HUDDERSFIELD.—The Corporation have decided they will not establish an omnibus service to Newmill unless the Urban Council give a written assurance that no payment will be claimed for mileage or for alteration and adaptation of roads.

Straker-Squire Single-Deck Omnibuses.

Straker-Squire Double-Deck Omnibuses.

STOCKTON.—At a meeting of the Town Council it was stated that the new omnibus service is to be augmented, on the lesser used routes, by three small Ford omnibuses of the one-man type. It was mentioned that of all the routes only that between Yarm and Stockton was at present paying.

ELGIN.—At the Sheriff's Court the Elgin and District Omnibus Company pleaded guilty to having used an omnibus on the highway between Elgin and Forres without having first obtained the consent of the County Council. The company's solicitor took the responsibility for misconstruing the Act, and the Sheriff imposed a fine of £5.

HULL.—The Corporation tramways manager reported the result of his inspection of omnibuses which Liverpool Corporation had for disposal, but he could not recommend the purchase of second-hand omnibuses in preference to new vehicles. The committee agreed, as originally proposed, to purchase new A.E.C. motor omnibuses.

DERBY.—The Trent Motor Traction Company, an offshoot of the British Automobile Company, have this summer increased their fleet to 46 vehicles. The company have been fairly treated by the local authority, the market square being available as a terminus. Every facility is afforded to passengers, who are provided with waiting-room and an information bureau. An important part of the operations is the carriage of parcels. The services link with others serving Birmingham, Manchester, and numerous Midland towns.

BIRMINGHAM.—In his advertisements of the facilities offered by the Midland "Red" Motor Services, Mr. O. C. Power, the traffic manager, states that the company's omnibuses run at frequent intervals from the Bull Ring, New Street, and Old Square direct to almost every town and village within forty miles of the city. Connection is given with omnibuses running all over the Midland Counties. Special saloon omnibuses and coaches are provided for private parties, and day and half-day excursions and circular tours are provided from the Bull Ring at cheap rates.

EDINBURGH.—In his annual report to the Tramways Committee on July 18, Mr. R. S. Pilcher, the manager, states that there are at present 81 omnibuses in service, and that the revenue has steadily increased, one route—Easter Road to Slateford Road—drawing as much as £1,123 per week. The total revenue is £93,000, the working expenses £69,881, interest and sinking fund contributions £10,813, leaving a balance of £12,428 18s., together with £1,482 19s. brought forward from last year's accounts, which is available to be placed to the credit of a reserve account, should the committee approve of the creation of such an account. During the year omnibus services have been introduced on several cable tramway routes. Some of the cable tramway routes closed down were being operated at a considerable loss, whereas now they are being operated on a profitable basis, in addition to which new districts have been supplied with omnibus services. It would not have been possible, the manager considers, to have kept the tramways undertaking from rate relief without the aid of the omnibuses and the coaching section. A reference to the latter appears in another column.

OMNIBUS COMPETITION.

COMPLAINT BY SHEFFIELD CORPORATION.

Mr. A. R. Fearnley, general manager of the Sheffield Corporation Tramways, has published a statement respecting competition instituted by Messrs. W. T. Underwood, Limited, on several routes outside the borough worked by the Corporation's omnibuses by virtue of powers obtained from Parliament with the support of the local authorities. The Tramways Committee, Mr. Fearnley says, have developed these services until they have now work for 41 omnibuses, regular employment for 200 men, and an income at the present time up to £2,500 per week.

The private firm's vehicles also run on routes where the Tramways Committee intended to provide a service as early as possible, and Mr. Fearnley states that this information was given to Messrs. Underwood so that the firm would not incur any expenditure without knowing the position. While the Corporation omnibuses start running on two routes at 7 and 7.30 a.m., the rival vehicles do not start until 10.30 and 11 a.m., which "shows the difference between the object of the Corporation service and the object of the Underwood service." The latter, Mr. Fearnley asserts, is not a local firm, but is associated with a big omnibus combine.

Mr. Fearnley adds that the competing service "uses the Corporation's loading stations at the tramway termini and *en route*, and their time tables were so arranged that they could run immediately in front of, and with the definite object of taking the passenger traffic built up by the Corporation's omnibus services. Messrs. Underwood have a great advantage in regard to expenses by employing women conductors at somewhere approximately half the rate of wages to those paid to the Sheffield tramwaymen."

"The policy appears to be to tack themselves on to a district where a traffic nucleus has been established or where there is already a tramway service, and obtain the benefit of the municipal enterprise in such places, their object clearly being to try and beat down local municipal services which are simply worked for the public convenience and not for profit.

"The committee propose, with the sanction of the Council, to maintain and extend the omnibus services so that they will be feeders to the tramway system on which the city has invested a million and a half of money, and also so that they may continue to provide the outlying districts with a reliable and reasonably satisfactory means of transport between their districts and the city of Sheffield."

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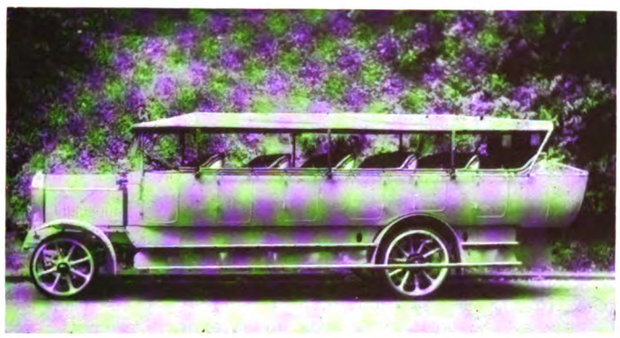
MOTOR TRAFFIC

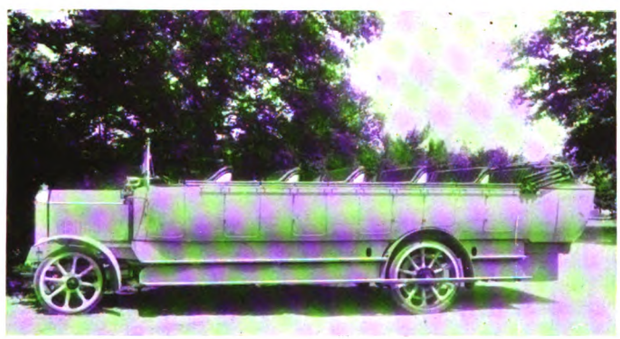
NEW DENNIS COACH.

Up-to-date in every respect is the new motor coach manufactured by Dennis Brothers, Limited. The Guildford Works were prepared for a great increase this summer in the popularity of motor coaching, and this attractive vehicle is the result of the company's study of



Improved Dennis Coach with Hood in position.

the task of introducing improvements. Seats are provided for 28 adults, the seating being of the type that enables the occupant to sit well back, thus escaping the unpleasantness of the knees coming in contact with the back of the seat in front. Now that so many



Dennis Bros.' New 28-seat Coach with Two Step Boards.

persons are using the coach to visit the seaside on holiday it is important to note that there is sufficient room to place a small suit case on the floor, while for more bulky packages a commodious receptacle is provided beneath the space occupied by the hood when

Luggage Carrier at rear of Dennis Coach.

folded. Another improvement is that two step boards enable entry to the body to be gained with ease, while the lower board also encloses the rear wheel.

MOTOR VEHICLES FOR MUNICIPALITIES.

LANCASHIRE COUNTY COUNCIL have decided to purchase a motor ambulance at a cost of £400.

DONCASTER COUNCIL are seeking sanction to borrow £2,083 for the purchase of a motor fire engine.

LIVERPOOL CORPORATION propose to pool the Corporation motor cars, and to establish a central garage.

ESTON URBAN COUNCIL have obtained sanction to apply for a loan of £1,579 for a motor wagon and trailer.

DORKING URBAN COUNCIL, who have decided to purchase a motor fire engine, are borrowing £1,930 for the purpose.

YORK CITY COUNCIL have authorised the city engineer to obtain tenders for the supply of a motor tipping wagon.

SOUTHEND CORPORATION have asked the borough surveyor to make inquiries as to the purchase of a steam or petrol roller.

NEWPORT (ISLE OF WIGHT) COUNCIL have instructed the surveyor to make inquiries as to the cost of a steam or petrol motor water van.

SYDNEY (N.S.W.) Council have accepted an offer by Leyland Motors, Limited, for the supply and fixing of hydraulic tip gear for a motor lorry at £230.

BOLTON CORPORATION CLEANSING COMMITTEE have decided to purchase three additional motor tipping wagons and also a motor cycle for the chief inspector.

GRIMSBY CORPORATION have decided to purchase a 20-H.P. chassis for £600 from the Daimler Co., and an ambulance body for £390 from Messrs. Wilson and Stockall.

WIGAN CORPORATION have had a 4-ton motor tipping wagon on hire from Messrs. Walker Brothers, whose offer to sell it to the Corporation for £550 has been accepted.

STRETFORD URBAN COUNCIL have asked a special committee to arrange for the early provision of suitable motors to expedite the work of collection and disposal of house refuse.

BRIDLINGTON CORPORATION have asked the borough surveyor to inspect and test a Dennis motor fire engine for sale at £1,200 by the Port of Queenborough Development Co. Ltd., Richborough.

GLASGOW PARKS COMMITTEE have purchased from M'Creath, Taylor and Co. a second-hand petrol-driven water ballast roller for £450, with the option of securing another at a reduction of £50.

EAST HAM WORKS COMMITTEE recommend acceptance of the tender of the North British Rubber Co. for the supply of two sets of Clincher solid tires for the motor dust vans at £5 17s. 4d. per set.

LEWISHAM BOROUGH COUNCIL are recommended by their Health Committee to purchase for the disinfecting department a 17-24 H.P. four cylinder delivery van from the British Automotive Company at a cost of £450.

SHEFFIELD ELECTRICITY COMMITTEE have decided to purchase two 5-6 ton steam tipping wagons, one fitted with cable haulage gear and jib crane, for £1,155 and £1,235 respectively, from the Yorkshire Commercial Motor Co.

HOVE CORPORATION having now purchased electric vehicles for refuse collection, suggest transferring the cleansing work from the Sanitary Committee to the Works Committee, as it is now more or less of an engineering character.

WIGAN CORPORATION electricity engineer suggested the purchase of a motor tipping wagon for his department, and the Corporation appointed a sub-committee to discuss the provision of such wagons for all the municipal departments.

YORK STREETS COMMITTEE have considered tenders for the supply of a 4-ton petrol wagon, and recommend acceptance of the offer of Karrier Motors, Limited, Huddersfield, for the supply of a 50-H.P. side and end tipping wagon at £1,219 10s.

CAMBERWELL BOROUGH COUNCIL report delivery of a Leyland vacuum gully emptier. The terms of purchase were subject to the rise and fall of the market, and the Leyland Motors, Limited, have intimated that they are able to reduce the price from £1,790 to £1,535, less the special discount of 5 per cent. allowed to the Council.

ABERDEEN OMNIBUSES.—The omnibus undertaking completed the first year of operation during the last week in July. Up to the end of 1920 the number of passengers was 1,153, while for the first half of the present year 40,405 were carried. The receipts during the latter period were £2,852.

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MOTOR TRAFFIC

A.E.C. CHASSIS IN INDIA.

The appended illustration shows vehicles forming part of a fleet of Walford Transport, Limited, of Calcutta, which were supplied to this company by the Associated Equipment Company. The lorries and trailers shown in the illustration were photographed when engaged in moving a consignment of 60,000 bags of rice, weighing 1¼ maunds per bag, a total equivalent of 4,000 tons. These bags had to be carried a distance of approximately six miles, giving a ton mileage of 24,000. When writing in regard to the vehicles, Messrs. Walford and Company mentioned that the roads were in fairly good condition, and as they were quite level, the four trailers were used in carrying a weight of eight tons, viz., four tons on the lorry and four tons on the trailer.

WALTHAMSTOW WORKS OF THE A. E. CO.

The interesting photograph below reproduces a view recently taken from the air of the Associated Equipment Company's works at Walthamstow. The portion of the works enclosed in a white line shows the extent of the shops in 1906, when the floor area was only 3,000 sq. ft. At the present day the works occupy a total area of about 1,400 acres.

As the Walthamstow works are the home of the well-known London omnibus chassis, the following record of output of chassis constructed for the London General Omnibus Company alone is of interest—

Type	First Built.	Total Built.
X... ...	... August 12, 1909 ...	61
B... ...	... October 7, 1910 ...	2,900
K... ...	... October 5, 1919 ...	1,054
S	... November 1, 1920 ...	30

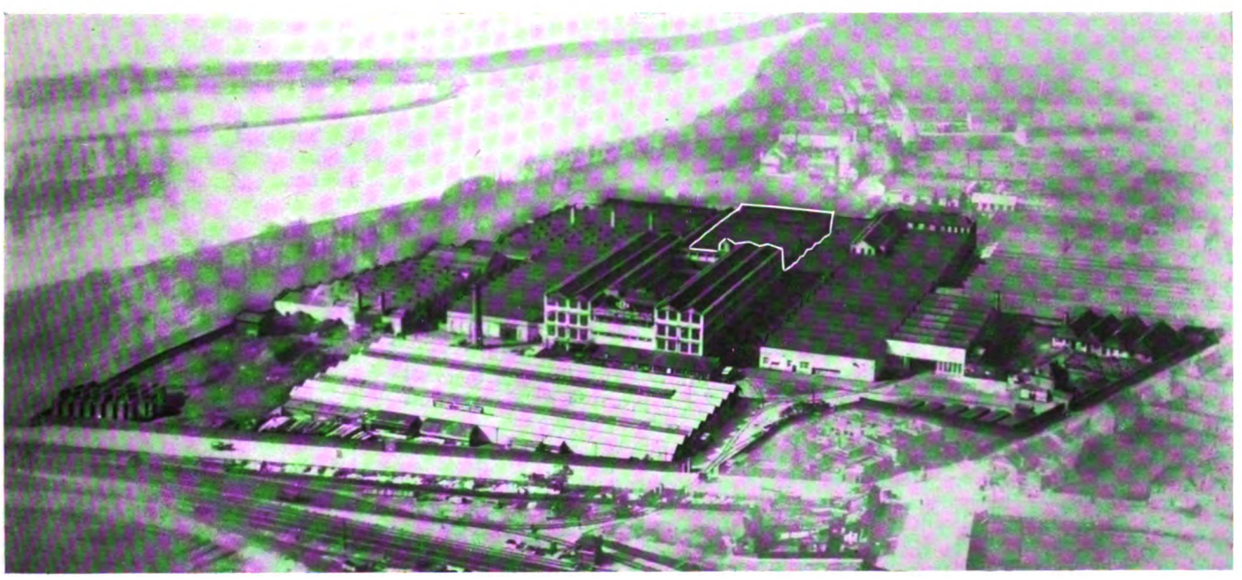
of an order for 265

MOTOR TRAFFIC NOTES.

Refreshment for Omnibus Employees.—During the hot weather the London General Omnibus Company provided barley water for their employees at terminal points.

Mechanical Breaker of Concrete.—The Ingersoll-Rand concrete breaker has been in use for clearing away the old bed of the road at New Bridge Street, E.C. Operated by two men, it broke up the concrete at the rate of 24 sq. yards an hour.

No Exemption for Municipal Vehicles.—Hammersmith Borough Council, who asked that all municipal motor vehicles should be exempt from licence duty, now report receipt of a letter from the Transport Ministry that no legislation can be initiated to give effect to the proposal.



A Bird's Eye View of Walthamstow Works of Associated Equipment Co.

Part enclosed in white line shows extent of Works in 1906.

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MOTOR TRAFFIC

OMNIBUSES TO REPLACE A TRAMWAY.—Heston and Isleworth District Council have been assured by the L.G.O.C. that they will provide an adequate omnibus service in the event, as proposed, of the abandonment of the tramways in Staines Road. The tramway belongs to the United Tramways Company.

A LIVERPOOL PREFERENCE TO HORSES.—At the distribution of May Day prizes to Liverpool carters, on July 20, Alderman Muirhead stated that the Liverpool experience was that for particular sorts of dock work, where only short journeys had to be performed, horse transport was the most economical method.

SUSPENDED DRIVERS.—Bournemouth Corporation Licensing Committee are taking effective measures to control drivers. One, reported because a cab meter was not working properly, has been suspended for a week, and five omnibus drivers have had their licences suspended for a week because they either left their vehicles or touted.

AN INCENTIVE TO SIGNPOSTING.—In handing over to the County Councils the scheme of erecting signposts of uniform design, the Ministry of Transport regretted that the Government were unable to render financial aid. The Ministry have since stated that the cost of providing new signs may be charged to improvements to roads in Classes 1 and 2.

CONSTRUCTION OF 900 MILES OF ROAD IN CHINA.—The American Director of Relief Operations in China reports that when the programme of the American Red Cross Society for the relief of famine sufferers in that country is completed in August, there will remain approximately 900 miles of excellent highway constructed under the direction of Red Cross engineers.

TRAMCAR, OMNIBUS, AND TUBE TRIPS.—A beautifully illustrated booklet has been issued by the Underground group of companies, giving routes, fares, and other details of beauty spots round London easily reached by train, omnibus, or tramway. Copies can be obtained from the Traffic Advertising Agent, Underground Railways, Cranbourne Chambers, Leicester Square, W.C.

REPLACEMENT OF FADED LICENCES.—As many cases have occurred in which the manuscript entries or the Council's date stamp on motor vehicle licences have become illegible owing to the action of sunlight, the Ministry of Transport have issued instructions to licensing authorities to furnish duplicate licences free of charge in cases where the illegibility is not due to any fault of the licensee.

"CROSS THE ROAD HERE."—The creation of "safety zones" was discussed at a meeting of the London "Safety First" Council. Dr. F. J. Waldo, coroner, City of London and Southwark, described an experiment now being made in Southwark with the object of providing safer facilities for crossing roadways at certain fixed or traffic points, indicated by signs on lamp-posts and lettered, "Cross the Road Here."

WHEEL THAT DOUBLES THE LIFE OF A TIRE.—It is claimed for the new Trinity suspension wheel invented by Mr. F. W. Baker, of the Baker Rim Company, of Stourbridge, that it doubles the life of the tires, compared with an ordinary wheel. The reduction of wear is ascribed among other things to the effectual arrest and absorption of road shocks at the periphery of the wheel itself, as the load is carried in true suspension.

GARAGE SCHEME FOR LONDON.—Plans have been submitted to the London County Council in connection with the erection of a huge garage upon the island site on the south side of Euston Road abutting on Chesterfield Street and Belgrave Street. The plans indicate that the building will be of seven storeys, containing 500 cubicles to house motor cars to be carried to each floor by lifts. Quarters for drivers are also provided as well as repairing shops.

CARNARVONSHIRE COUNCIL TESTS THE CHARAPHONE.—A device which attracted attention at last year's Olympia exhibition of commercial motor vehicles was the charaphone. It is an attachment for any design of heavy or light car, and serves to convey to the driver the sound signals of following vehicles which desire to pass. A few days ago it was tested by members of the Surveyor's Committee of the Carnarvonshire County Council on a local road where traffic is heavy.

"WHY NOT A MOTORING HOLIDAY?"—This heading is used by the Lancashire United Tramways, Limited, to their advertisements in local newspapers setting forth the facilities offered by the company's omnibuses, coaches, and private landaulettes. Among the coaches are 14-seat vehicles running on pneumatic tires. The company take "parties of 6 to 1,500 anywhere." Programmes of day and period tours are advertised in evening newspapers, and there are booking agents in numerous towns.

COUNTY COUNCILS AND THE ROADS DEPARTMENT.—Consideration was given at the annual meeting of the County Councils Association, on July 27, to the probable alteration of the status of the Ministry of Transport owing to the forthcoming decontrol of railways. A resolution was adopted urging that in the event of departmental reorganisation "the interests of the country will best be served by the central supervision of roads and road traffic, and matters incidental thereto, being placed in the charge of a separate minor department."

LICENSED VEHICLES AND ELECTIONS.—The Sheffield magistrates, on July 22, heard summonses against the proprietor of a hackney carriage (a 14-seat coach) for employing it to convey electors to the poll in a municipal by-election, and against a hackney carriage driver for driving the conveyance. The prosecuting solicitor stated that if a licensed vehicle was used for the purpose alleged, the Municipal Election (Corrupt and Illegal Practices) Act was contravened. The summons against the owner was dismissed, but the driver was fined 20s.

PEDESTRIAN'S RIGHT TO CROSS THE ROAD.—At Lambeth County Court, on July 11, Charles Houghton was awarded £28 damages and costs against Percy Lucas, whose motor car had knocked plaintiff down while crossing the road. The defence was that plaintiff was negligent in crossing in front of a standing tramcar. When he passed the car he hesitated and then turned back. Judge Parry held that plaintiff was within his rights in crossing the road in front of a standing car. Defendant in coming out of the line of traffic should have seen that the road was clear.

4-Ton Van Manufactured throughout by the Bristol Tramways and Carriage Co.

MOTOR LABORATORY FOR HOSPITAL WORK.—Discussing the causes and prevention of blindness at the British Medical Association conference held at Newcastle, Mr. Bishop Harman stated that the only means of prevention was the treatment of the disease in the expectant mother. What was needed was the establishment of such medical arrangements that diagnosis and treatment could be made as swiftly as a fire brigade could be brought in. There should be a motor car fitted with a small laboratory equipment with an expert opthalmic surgeon and nurse. The unit should be available for immediate attendance at any home when a suspected case occurs.

AUTOMOBILE ASSOCIATION'S WORK ON THE ROADS.—It was reported at the annual meeting of the Automobile Association, on July 27, that during the year the patrol work had been extended, and the men's pedal cycles were being exchanged for motor cycles. The patrols had dealt with 1,055 cases of accident, of which 36 were fatal, and had rendered first aid in 85 cases. The roadside telephone boxes, now available day and night, had been increased in number, and instead of only one fuel supply station at Aldermaston on the Bath road, there were now eight. Signposts erected during the year numbered 4,797. The membership had increased from 120,000 to 169,000.

FATALITY THROUGH TRAILER BREAKING AWAY.—An inquest was held at St. Helens on a man who was fatally injured as the result of a trailer breaking away from a motor wagon in Corporation Street. The trailer, which carried a load of 4 tons, was fastened by a connecting pole about 4 ft. long, a split pin holding it in position. After the mishap the pin could not be found. The jury returned a verdict of death from misadventure, and the coroner remarked that those responsible for the running of motor wagons and trailers ought to devise means of preventing trailers from running way. If a man had been sitting on the trailer with a brake that he could have applied, he might have prevented the accident.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, SEPTEMBER 15, 1921. VOL. L.

SALFORD AND ITS MUNICIPAL TRAMWAY SYSTEM.

AN EXTENSIVE UNDERTAKING TO BE VISITED BY THE MUNICIPAL TRAMWAYS ASSOCIATION.

The annual conference of the Municipal Tramways Association is this year to be held at Salford, where it will open on September 28. In 1914, this borough was chosen as the meeting place, but it was then deemed advisable, on account of the circumstances arising from the outbreak of war, to cancel the arrangements for that year and to hold only the annual business meeting, which subsequently took place in London. The statistics of the intervening seven years will serve to show the delegates the great expansion of the tramways undertaking during that period. The inspection, which they will no doubt have an opportunity of making, is likely to leave the impression that the system is well in keeping with Salford's industrial importance and municipal enterprise. The tramways have attained their prosperity under the general managership of Mr. G. W. Holford, who has been the head executive officer for sixteen years, following service as chief assistant to Mr. E. Hatton, now general manager and engineer to the Newcastle-upon-Tyne Corporation Tramways. Indications of the progressive policy of Mr. Holford are to be seen, for instance, in the improvement of the rolling stock and the provision of a service of omnibuses in districts that are without tramways.

Salford Central Car Depot, Stores and Repair Shops.

Salford is a Parliamentary and municipal borough in south-east Lancashire, 188 miles from London and 31 from Liverpool, and like Manchester, it is one of the leading centres of the cotton industry. The charter of incorporation was obtained in 1884. While the central part of the town is of an industrial character, the outer districts contain many picturesque spots, and on the northern side are situated attractive residential suburbs. The principal docks of the Manchester Ship Canal are at Salford, and also the Manchester Racecourse. There are several parks belonging to the Corporation, notably Peel Park, Buile Hill Park, and Albert Park, the total area of the parks and recreation grounds being 283 acres. The area of the municipal borough is 5,282 acres. At the census of 1911, the population was 231,357, and this year's census shows a total of 234,150 inhabitants. The passengers carried by the tramways system in 1920-21 were equal to the transportation of the population 223 times a year.

Five sets of public baths have been erected within the borough, and numerous libraries and reading rooms. The Corporation are the owners of a cattle market—the second largest in the country. The water supply is obtained from the Manchester Corporation. The

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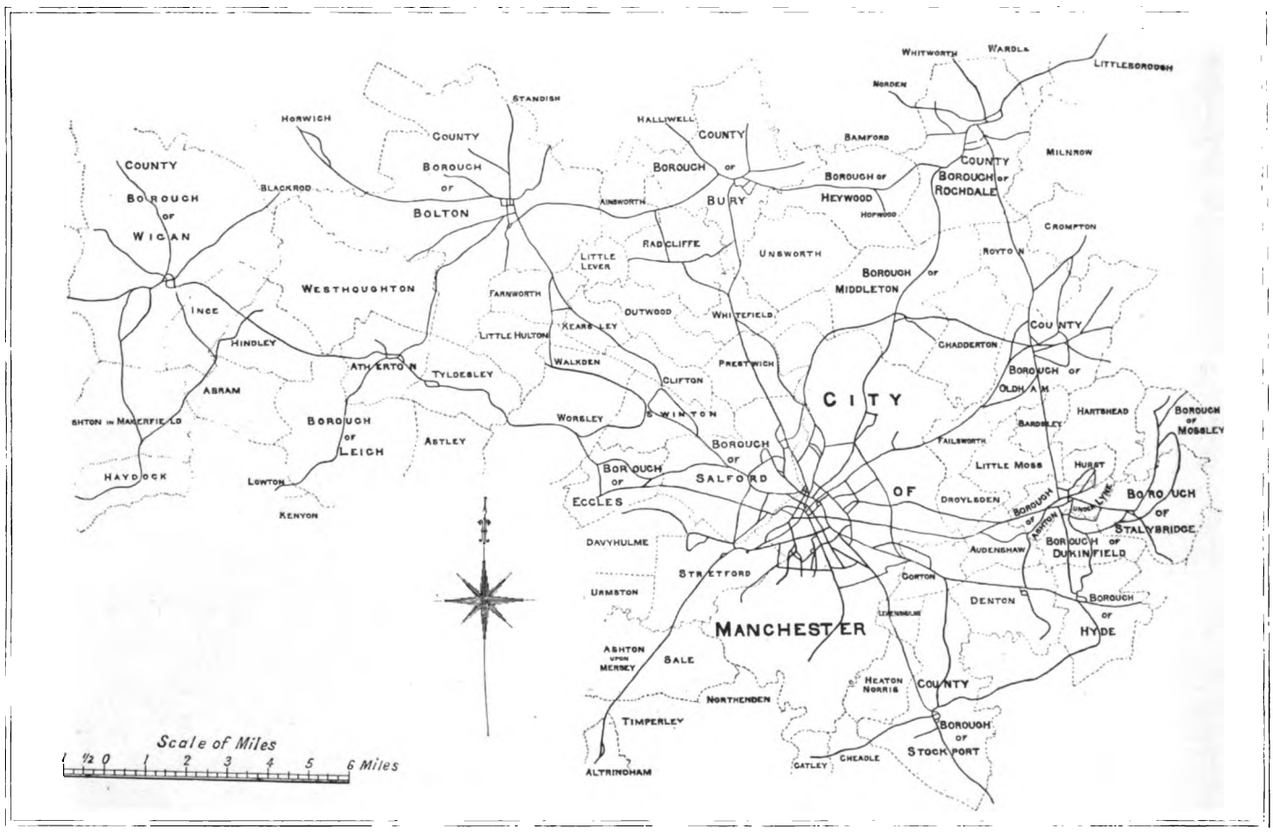
tramway undertaking, the electricity and the gas works are owned by the Salford Municipality.

The tramways originally formed part of a horse tramway-car system worked by the Manchester Carriage and Tramways Company. In the year 1901, the leases having expired, the Corporation took over the tramways, commenced to equip them electrically, and a length of the line so converted was opened in that year. This work was fully described and illustrated in the issue of this journal of December 6, 1901. The length of line owned by the Corporation at that time comprised about 30 miles. Since then further portions of the system have been opened, and the total length now operated by the Corporation measures 75·8 miles of single track, for the maintenance, etc., of about 56 miles of which they are responsible. In addition to those within the borough, the Corporation also operate the tramways in the adjoining borough of Eccles and in the urban districts of Swinton, Pendlebury, Prestwich, and Whitefield. The department have running powers over a portion of the lines in the adjoining city of Manchester and over a short portion of the South Lancashire tramway system at Worsley; and they operate (jointly with the Manchester Corporation) the lines owned by the Trafford Park Estates Company, Limited, which were formerly worked by that Company.

The accompanying map shows how important a link the Salford system forms with that of many other Lancashire towns, as it is possible to travel by car from Manchester, through Salford, to Liverpool with a break of only a few yards. It follows, necessarily, that the Corporation must be deeply interested in any scheme of transit of goods by tramways between the docks of the Manchester Ship Canal, and many busy manufacturing towns in south and east Lancashire areas.

The undertaking has made remarkable progress since its inception, as the following figures will show. When the lines were owned by the company the approximate annual income was £90,000; the income of the undertaking for the year ended March 31, 1921, amounted to £542,746. The Corporation have contributed the sum of £306,532 in relief of rates, and they have also paid into the depreciation and renewals fund £175,610. Extensive renewals have been made, and about 23⅓ miles of single track have been relaid.

Many improvements have been effected in the several branches of the undertaking. Inter-running with the Manchester and other systems has existed for many years. Notwithstanding the changed economic outlook the Tramways Committee are still beset with requests for privileges and concessions, but their policy is to resist all such applications as long as the Corporation desire the undertaking to pay its way.



Route Map of Tramways in Salford, Manchester, and Neighbouring Boroughs and Districts.

The committee have been fortunate in the fact that they have had, since their inauguration, the services as Chairman of the late Alderman Linsley, whose lamented death occurred last month and since the arrangements for the conference were made. That gentleman's whole concern was for the welfare of the undertaking and the benefit of the inhabitants generally. Other circumstances favourable to the working of the system are that very few changes have been made in the personnel of the committee, and that the management has been marked by both insight and enterprise, coupled with ability to secure the loyalty of the staff and employees.

With a tramway system operating in the districts of several local authorities, numerous agreements have had to be made dealing with rentals and other payments. In the Manchester area, the principle underlying

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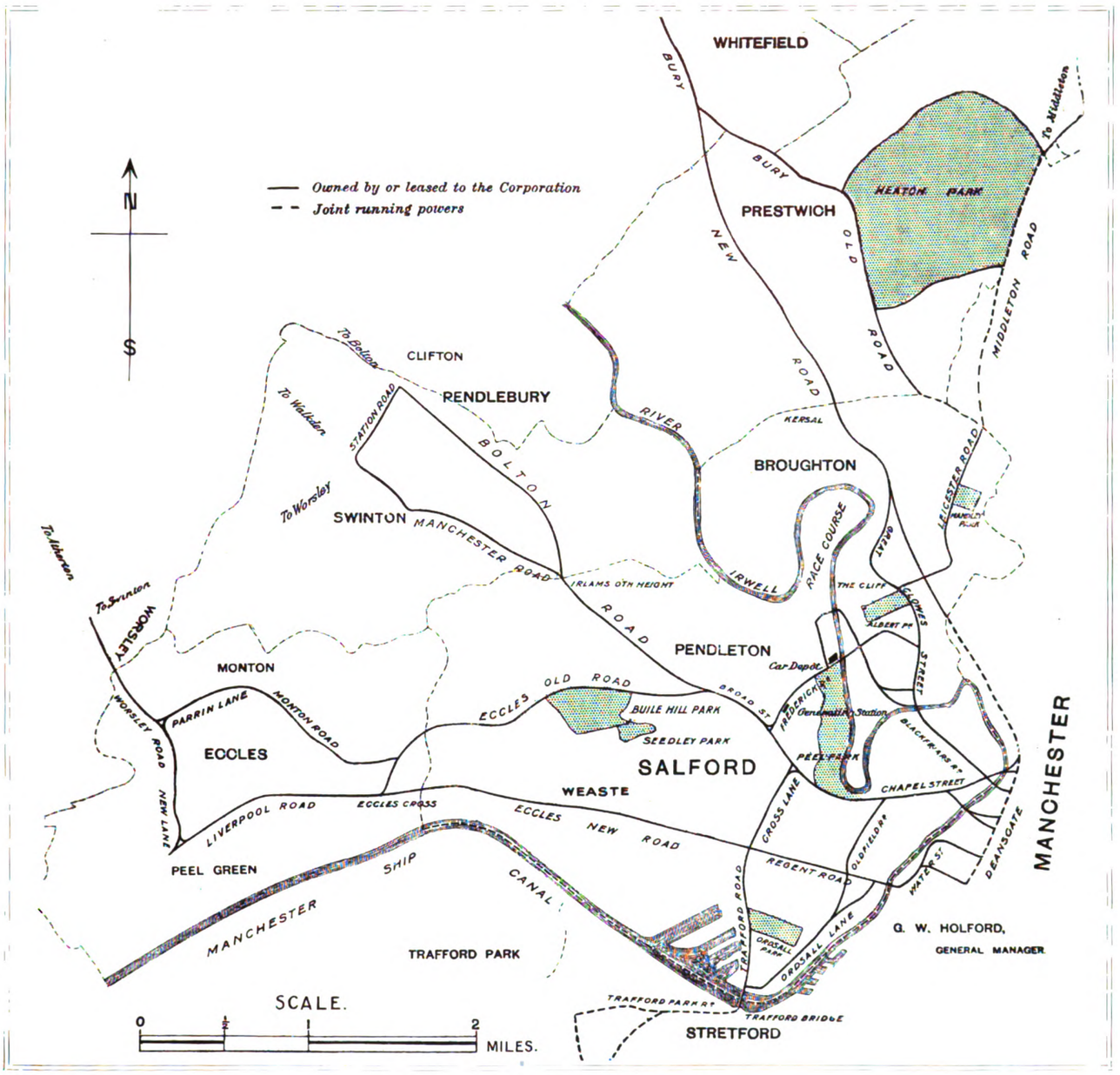
the arrangement is that the Salford Corporation shall not retain any profit made in that area. With regard to the Eccles tramways, the Salford Corporation pay a rental of 10 per cent. on the capital cost to the Eccles Council; in addition they also defray the interest and sinking fund charges of certain street improvements. In the Swinton and Pendlebury districts and in the Whitefield area the Corporation pay off the capital cost of the tramways during the term of the lease; while in the Prestwich area they also pay to the Prestwich Urban Council one-third of the profits made upon



Plan of Salford Corporation Tramways.

such tramways. In the Trafford Park area and on the South Lancashire Company's system the Salford Corporation retain only their working expenses.

A small portion of the Salford system is operated by the Bury Corporation, for which they pay to Salford an agreed figure representing the profit made by them over such lines.

PERMANENT WAY.

The permanent way is under the joint charge of the general manager and the borough surveyor (Lt.-Col. E. B. Martin, R.E., D.S.O.), and is maintained in excellent condition, notwithstanding the trouble caused by rail corrugations. The elimination of these has been secured by means of grinding blocks of the "Bulldog" type, which are fitted to the truck of the watering car. The water in the tank is used to keep the rails clean and cool whilst the blocks are travelling over them.

When the permanent way was first laid down, rails weighing 102 lb. per yard and 60 ft. long were used, but on all new and renewal work the B.S.S. No. 4 rail, modified and known as B.S.S. No. 48, is adopted throughout. On all new curved work the B.S.S. No. 4 C rail has been adopted. Together with the 23⅓ miles of single track relaid, the special work of most of the important junctions, etc., has been renewed, together with the points and crossings in all single track within the borough. In a great portion of new and renewal work the rails have been welded by the Thermit process with satisfactory results, but the Corporation have now purchased an electric welding

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plant, with which the department have already welded the 220 joints on a length of single track. In addition, the Rail Welding Company have electrically welded 1,400 joints in the Whitefield and Prestwich areas. Most of the rails used on the Salford system have been supplied by Walter Scott, Limited, of Leeds, and a portion also by Bolckow Vaughan & Co.; the special trackwork has been supplied by Hadfields, Limited, and Edgar Allen and Company, Limited, of Sheffield. The standard length of points used is 15 ft., and new points and crossings are of solid manganese. The system comprises many important junctions, and in "Collins" type, supplied by Quilliam Brothers, of Salford. On several lengths of single line signalling apparatus is used, and has given very satisfactory results.

ROLLING STOCK.

The department possesses 224 cars, all double deck, and of the following types—

Double-deck single-truck cars, 2 motor equipment	81
Double-deck single-truck cars, 2 motor equipment, with vestibule ends on lower saloon	15
Double-deck single-truck cars, 2 motor equipment, with top covers	52
Double-deck bogie cars, 4 motor equipment and top covers ...	20
Double-deck bogie cars, 4 motor equipment, without top covers	24

Cross Lane Junction, Salford Corporation Tramways.
One of the Largest Tramway Junctions in the United Kingdom, with Curves at each of Four Corners.

the accompanying view and plan is seen the one known as Cross Lane Junction, which is the largest in the country. This was relaid a few years ago without a stoppage of traffic, and is, practically, solid manganese throughout.

OVERHEAD EQUIPMENT.

In the early years of the undertaking an arrangement of centre poles was largely adopted, but after several years' experience it was decided to substitute side poles, and the change has now practically been completed. Span-wire construction and side poles with bracket-arm construction are used on various portions. The whole of the poles have been supplied by James Russell and Sons, Wednesbury. With regard to the trolley wire, experiments have been made from time to time with almost every variety, but it has been found that the round 0·4 trolley wire has given the best results. At a large number of junctions automatic point controllers have been fixed, these being mainly of the

Double-deck bogie cars, 2 motor equipment, with top covers and vestibule ends	2
Double-deck bogie cars, 2 motor equipment, with top covers, vestibule ends and *front exit*	2
Double-deck bogie cars, 2 motor equipment, with top covers and vestibule ends	12
Double-deck bogie cars, 2 motor equipment, vestibule ends, uncovered top	12
Double-deck bogie cars, 2 motor equipment, uncovered tops ...	3
Double-deck single truck, 2 motor equipment, with top cover and vestibule ends	1
Total	224
Motor Omnibuses	8

The cars are fitted with "Peacock" brakes, which are much appreciated by the motormen. They are also equipped with the "Cummins" magnetic sanding apparatus, which operates automatically in conjunction with the electric brake, and practically on the whole of the cars "Barrett" controller regulators have been attached to the controllers. The sanding gear in use is principally that of the Taylor (Liverpool) type.

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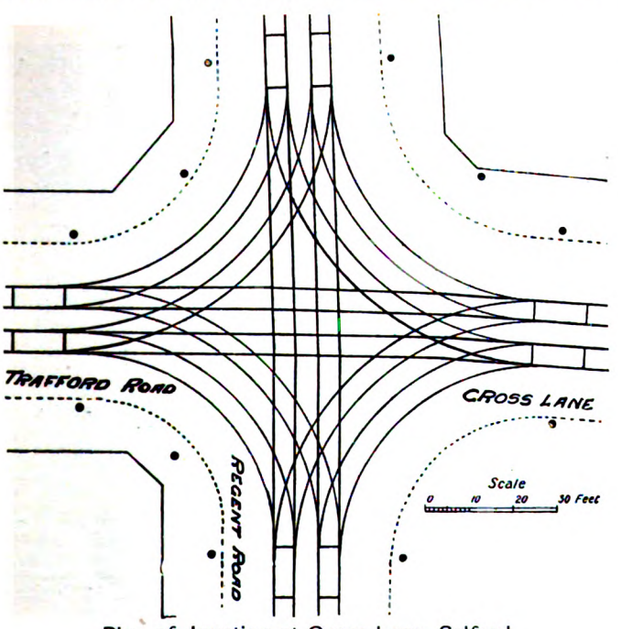
Cast-iron brake shoes are used, as well as those of the National Rail and Tramway Appliances Co. Steel tyres are fitted throughout, and their average life is about 70,000 miles. The size of the axles varies in accordance with the type and weight of the cars. Part of the rolling stock was obtained from the United Electric Car Company, of Preston (now the English Electric Company, Limited), part from Hurst, Nelson and Company, Motherwell, and part from the Brush Electrical Engineering Company, the remainder being from firms not now in existence. In addition to the tramcars, the department also possesses a miscellaneous stock of other vehicles, comprising two motor tower wagons, motor lorry, two motor cars, horse-drawn tower wagon, four salt wagons, watering car, horses, etc.



Plan of Junction at Cross Lane, Salford.
(A Photograph of this Junction is given on the opposite page.)

CARS WITH INTERIOR STAIRCASES AND FRONT EXIT.

During the past summer the department placed in service two reconstructed cars, which mark a step forward in the provision of rolling stock designed to secure quicker loading and unloading and the prevention of platform accidents. These cars are on a plan similar in the main to that adopted by the general manager and engineer of the Newcastle tramways for conversion of a considerable number of the cars of that city, where the operation of the reconstructed bodies with front exit and inside staircases has given encouraging results as regards freedom from accidents. No doubt the Salford management will have an equally satisfactory experience to record in future annual reports. The car is of the bogie type with the staircases to the upper deck fixed inside the lower saloon, and having platforms arranged for simultaneous loading and unloading at both ends. The passengers enter at the rear and leave at the front, an arrangement which conduces to their safety and decreases the running time.

Salford's Latest Type of Car, with Vestibules, Inside Stairways, and Front Exit.

MOTOR OMNIBUSES.

Under powers contained in the Salford Corporation Act, 1920, a motor omnibus service was recently inaugurated under the control of the tramways manager, and for this purpose a fleet of eight omnibuses was purchased. The chassis were supplied by the Leyland Motors, Limited, and the majority of the bodies were built by the English Electric Company, Limited. The service is as yet only in its experimental stage. As far as possible it caters for those districts through which tramways are not laid, and it has found general approval with the travelling public.

DEPOT, CAR SHEDS, SUB-OFFICES, ETC.

The whole of the service is operated from the central car depot, in which important extensions have been made from time to time. The whole of the stores and workshops are heated by hot air and all the car sheds proper by steam, during the winter months. The several workshops are fully equipped with the latest type of machinery. Formerly the permanent

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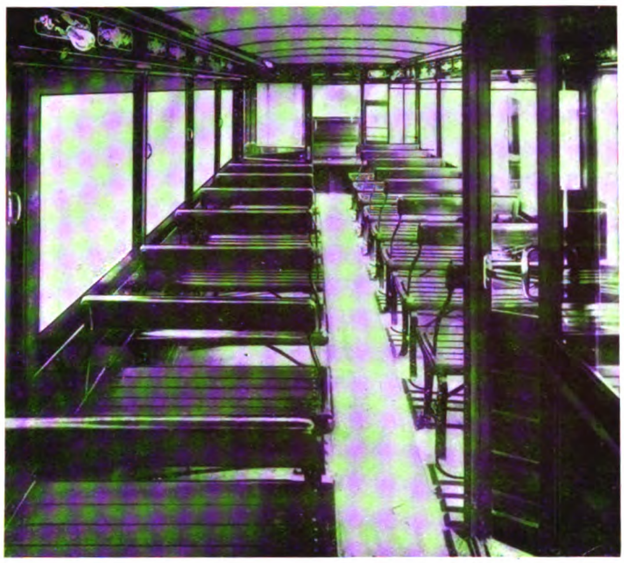
way workshops were situated at the rear of the car depot, but they have now been transferred to more convenient premises at the back of the Town Hall, Broughton. The sand-drying apparatus used is that of the "Robinson" type, which has given very satisfactory results. The sand is obtained mainly from the Mersey beds. In the front of the car depot are the offices of the depot superintendent and his staff; and



Interior of Upper Saloon of Car, with Inside Staircases.

also those of the traffic men who are responsible for the turning out of cars, etc., and for the overhead equipment. Mess rooms, day rooms, recreation rooms, a large hall, etc., are also in this building. In addition to these premises the Corporation occupy a large building in Blackfriars Street, bordering on the Manchester boundary, as general offices; the whole of the cars on the system pass within a few yards of these offices. The Corporation are also owners, and, in some cases, tenants of a number of sub-offices, and they have various waiting rooms, etc., on the system. Illustrations of three types of waiting rooms are appended.

ADMINISTRATION.

The whole of the undertaking is under the administration of the general manager, Mr. G. W. Holford, who has occupied his present position for sixteen years. The general manager is assisted by a staff comprising traffic, permanent way, rolling stock, and overhead equipment superintendents, with their several subordinate officers. Each head of a department is responsible to the general manager for the proper carrying out of his own duties, and for the conduct of those under him. The committee have on many occasions testified to the efficient manner in which the duties of these several officials have been executed.

TRAFFIC DEPARTMENT.

The traffic department is operated from the head offices in Blackfriars Street, under the control of the superintendent, Mr. J. W. Blakemore. The duty of superintending the outdoor work is allocated to traffic supervisors, and there is under them a large body of inspectors, who have to be competent to undertake temporary car repairs, ticket inspection, and other duties. Candidates for driving and conducting have to pass a medical examination before being trained for duty.

The present pay schedule is as follows—

	Motormen d. per hour	Conductors d. per hour
On appointment	17·00	17·00
After 1 year's service	17·53	17·25
,, 2 ,, ,, ...	18·09	17·81
,, 3 ,, ,, ...	18·50	18·25

JUNIOR CONDUCTORS (promoted from Trolley Boys).

	d. per hour.
On appointment at age of 19 years ...	14·25
At age of 20 years	14·9
,, 21 ,, ...	17·25

TROLLEY BOYS.

	Per day. s.	d.
On appointment at 15 years of age ...	4	0
At the end of 1 year's service	4	4
,, ,, 2 ,, ,, ...	4	8

Overtime.—Time and a quarter paid for all time worked over 48 hours per week. Time and a half paid for all time worked over 50 hours per week.

Sundays.—Time and a quarter paid to motormen, conductors and trolley boys on all the above rates for all time worked on Sundays.

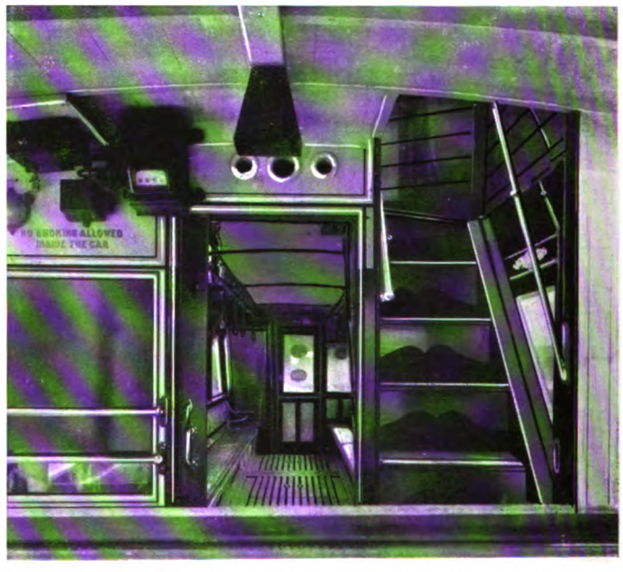
Holidays.—Eight days' leave with pay per annum.

TICKETS.

The ticket department is situated at the head office, and naturally many classes of tickets are used. Very few privilege tickets have been introduced; of special interest are those given to the blind residents of the borough. Trials have been made, from time to time, of advancing the hour during which early morning fares could be charged, and of issuing weekly contract tickets, but in both cases the results have been detrimental to the undertaking and the experiments have been discontinued. The present arrangement is that early morning tickets can be taken out by any passenger travelling on the cars up to 7 a.m., and, if desired, a return ticket can be obtained, available during any hour of the same day.

MEN'S ASSOCIATION, ETC.

The employees have formed an excellent social and athletic society, the membership of which is approximately 700. Very successful sports are held annually,



The Inside Stairway—as seen from the Front Platform.

certain of the events being confined to members, many others being open contests. The Tramways Committee have placed at the disposal of the society suitable accommodation at the central depot, compri-

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sing billiard, reading, and lecture rooms, etc. Cricket, football, swimming, bowling, and angling clubs have been formed.

ELECTRICAL ENERGY.

The electrical energy used on the tramways within the borough and in a portion of the outlying districts is supplied from the Corporation's electricity station, the price paid being 2·074d. per unit. Originally, the plant at the power station consisted of eight sets of Browett-Lindley engines and Mather and Platt dynamos, with 16 boilers of the Galloway type, but the electricity department have now substituted turbo-generators of greater capacity, and it is hoped in the near future that the Electricity Committee will be able to supply the tramways with power at a much cheaper rate. For electrical energy taken from Manchester Corporation the price of 1·5116d. per unit is paid; for that supplied by Eccles, 2·3408d. The tramways department do not own the cables between the electricity station and the trolley line, and the energy is metered at the generating station switchboards.

TRAMWAYS COMMITTEE.

The Tramways Committee for 1920-21 is now composed of the following members—

The Mayor and the Deputy Mayor (*ex-officio*); Alderman Barrett, J.P., *Chairman*; Councillor H. Hind, *Deputy Chairman*; Alderman Barker, J.P.; Alderman Hailwood, J.P.; Alderman Hulton, J.P.; Alderman Mather, J.P.; Councillor Billington, J.P.; Councillor Burnley, J.P.; Councillor Campion, J.P.; Councillor Crane; Councillor Finburgh, J.P.; Councillor Gorman; Councillor Greenwood; Councillor Littler.

Salford Omnibus with Leyland Chassis and English Electric Company's Body.

A Picturesque Tramway Shelter at Park Lane, Salford.

RESULTS OF THE LAST FINANCIAL YEAR.

The report of the general manager for the year ended March 31 last gives, among others, the following details—

The total length of tramways worked by the Corporation, 75⅝ miles, made up as follows—

Salford (owned by Corporation)	36·75	miles
Manchester (running powers by agreement)...	8·5	,,
Eccles (leased to Corporation)	8	,,
Swinton and Pendlebury (leased to Corporation)	6·75	,,
Prestwich (leased to Corporation)	8	,,
Whitefield (leased to Corporation)	4·5	,,
Trafford Park (worked jointly with the Manchester Corporation)	2·5	,,
Worsley (running powers by agreement) ...	0·8	,,

The total electrical energy used during the year for haulage, lighting of cars, etc., amounted to 11,285,865 units. Of this, 8,999,506 units were supplied by Salford Corporation electricity works, and the balance by three other authorities. The car-mileage run amounted to 5,935,863 miles, giving an average consumption of 1·901 units per car mile, a decrease of ·054 units per car mile against the previous year. (In this calculation the car-mileage run in Trafford Park is excluded, as the current is provided by the company, and the cost of the same is not included in the operating expenses retained by the Corporation out of the income from the lines.)

The stock of cars at the end of the year was 224. The majority have been equipped with meters for recording the current consumption, and this has resulted in much

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R. Chadwick,
Depot and Rolling Stock Superintendent.

H. Richardson,
Permanent Way Superintendent.

H. Weston,
Overhead Equipment Superintendent.

C. R. Bishop,
Chief General Clerk.

G. W. Holford,
General Manager.

J. W. Blakemore,
Traffic Superintendent.

E. R. Leather,
Chief Cashier.

R. Fearnhead,
Chief Traffic Clerk.

W. N. Rigg,
Chief Accounts Clerk.

OFFICIAL STAFF OF SALFORD CORPORATION TRAMWAYS.

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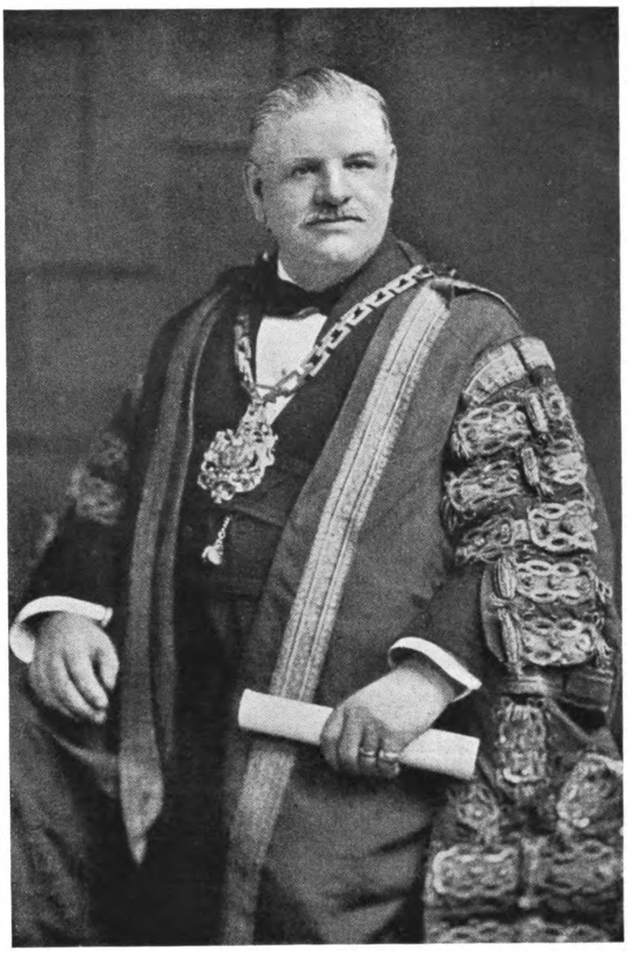
SALFORD CORPORATION TRAMWAYS—SUMMARY OF FINANCIAL RESULTS, 1914-21.

Year...	1914/15.	1915/16.	1916/17.	1917/18.	1918/19.	1919/20	1920/21.
	Mls. fur. chns. 75 6 4	Mls. fur. chns. 75 6 4	Mls. fur. chns. 75 6 4	Mls. fur. chns. 75 6 4	Mls. fur. chns. 75 6 4	Mls. fur. chns. 75 6 4	Mls. fur. chns. 75 6 4
Lines open (single track) miles							
Total capital expenditure...	£725,485	£752,263	£756,574	£765 295	£757 859	£757 927	£798,581
Loans outstanding	£511,853	£501,825	£492,587	£456 589	£480,301	£469,878	£450,536
Loans repaid and sinking funds	£211 864	£213,132	£235,410	£262,638	£263,306	£265,724	£276,831
Renewals and reserve funds	£27,574	£21,267	£18,592	£26,579	£33,726	£22,171	£9,600
Total receipts (traffic)	£257,977	£271,555	£281,207	£348,642	£419,180	£487,127	£533,347
Working expenses	£170,521	£169,916	£187,516	£220,709	£270,634	£365,856	£426,283
Net surplus...	£22,000	£22,000	£967	£16,970	£25,000	£20,000	£6,812
Appropriation of net surplus to relief of rates	£22,000	£22,000	Nil	£16,970	£25,000	£20,000	£6,812
Average total receipts per car-mile	10·807d.	12·051d.	12·033d.	15·016d.	19·159d.	19·929d.	21·482d.
Per cent. of operating expenses to total revenue	66%	62%	66%	63%	64%	73%	80%
Energy consumption per car-mile units	1·667	1·793	1·944	1·996	1·977	1·958	1·901
Car mileage	5,828,238	5,495,295	5,673,639	5,595,633	5,479,958	5,961,197	6,019,067
Passengers carried	54,343,908	56,458,266	58,801,870	65,061,878	70,433,126	80,587,359	78,142,501
Traffic revenue per mile of single track	£3,403	£3,628	£3,707	£4,597	£5,530	£6,424	£6,984
Average number of cars in use daily	153	146	144	141	139	158	164
Average working expenses per car-mile (excluding power costs)	4·972d.	5·248d.	5·626d.	6·854d.	8·910d.	11·468d.	13·412d.
Average working expenses per car-mile (including power costs)	7·022d.	7·420d.	7·933d.	9·467d.	11·853d.	14·729d.	10·868d.
Average fare paid per passenger	1·134d.	1·149d.	1·144d.	1·248d.	1·417d.	1·455d.	1·638d.
Total number of units used	9,692,543	9,724,788	10,881,594	11,008,348	10,666,672	11,513,587	11,285,865

economy being exercised by the motormen. Approximately a total of 23½ miles of the permanent way have now been relaid, and in nearly all the work rails of the Sandberg specification (which it is anticipated will give a longer life than those previously used) have been adopted, and the joints welded by the Thermit process.

The year's working resulted in a gross profit of £108,797, to which must be added the sum of £7,665, for interest on investments, etc., making a total available balance of £116,463, and this has been dealt with as follows—Payments to local authorities for running powers, etc., £33,011; interest and sinking fund charges, £66,414; repairs, etc., to property, Church Street, £225; contribution in relief of rates, £6,812; depreciation and renewals fund, £10,000.



The Mayor of Salford (Alderman Hampson, J.P.).

In addition to the above item of £10,000 as contribution to the depreciation and renewals fund, the sum of £10,000 was transferred from the capital account, and by the sale of old rails, etc., a further sum of £2,561, less bank interest of £307, making a total addition to this fund of £22,253 14s. 10d.

Although the total receipts exceeded those of the previous year, considerable additional expenditure has occurred, particularly in regard to the wages paid.

FINANCIAL RESULTS FOR 20 YEARS.

A summary of the financial position in each of the past 20 years, 1902 to 1921, is given on the following page. During this period the total receipts have increased from £144,486 to £529,836. Total receipts per car-mile in 1903 were 10·257d.; for the past year they were 21·161. The working expenses have

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increased from £134,892 in 1904 to £426,283, the present ratio being 79 per cent. The total number of passengers carried is now 78,141,614, an increase of 50 millions since the first year of working.

Alderman W. H. Barrett (*Chairman, Salford Tramways Committee*).

The following tables show the results of the working of the undertaking, namely—

Year ending 31st March.	Passengers Carried.	Miles Run.	Receipts.	Earnings per Car-mile.
1903	28,150,675	3,380,590	£144,486	10·257
1904	36,956,405	4,726,446	198,422	10·075
1905	39,213,560	4,884,590	209,438	10·290
1906	41,807,539	5,257,223	223,032	10·182
1907	43,614,123	5,268,933	231,908	10·565
1908	45,771,611	5,486,150	238,856	10·449
1909	45,975,584	5,785,469	237,302	9·844
1910	45,940,775	5,647,428	237,502	10·093
1911	46,659,553	5,824,474	242,139	9·978
1912	48,720,788	5,908,369	253,315	10·467
1913	50,113,120	5,854,830	259,705	10·645
1914	53,124,546	6,235,278	271,791	10·461
1915	54,343,908	5,828,232	256,826	10·577
1916	56,458,266	5,495,295	270,350	11·807
1917	58,801,870	5,673,639	280,166	11·851
1918	65,061,878	5,595,633	348,008	14·926
1919	70,433,126	5,479,958	416,010	18·219
1920	80,587,359	5,961,197	485,363	19·541
1921	78,141,501	6,089,067	529,382	21·108

	Gross Income.	Gross Profit.	Net Profit.	Contributed in Relief of Rates.	Placed to Depreciation and Renewals Fund.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1902	91,826 7 1	16,923 16 9	2,454 1 2	Nil	2,454 1 2
1903	144,825 19 1	39,926 7 4	13,008 5 1	10,000 0 0	3,008 5 1
1904	198,890 4 0	60,348 17 8	15,439 19 1	12,000 0 0	3,439 19 1
1905	211,101 1 0	76,208 17 3	21,934 15 5	13,000 0 0	8,934 15 5
1906	226,012 19 5	81,818 10 10	22,302 1 6	13,000 0 0	9,302 1 6
1907	237,443 3 5	95,249 15 1	27,889 11 10	13,000 0 0	14,889 11 10
1908	244,048 2 8	96,761 14 4	28,806 7 4	18,000 0 0	10,806 7 4
1909	242,551 19 1	87,585 3 9	17,263 17 10	17,000 0 0	263 17 10
1910	242,960 8 0	90,958 5 0	19,172 6 7	17,000 0 0	2,172 6 7
1911	248,442 10 4	92,857 7 9	19,442 2 3	18,750 0 0	692 2 3
1912	259,190 3 5	102,971 11 10	27,569 2 5	18,000 0 0	9,569 2 5
1913	266,510 12 8	105,426 1 8	31,374 5 5	22,000 0 0	9,374 5 5
1914	277,856 5 0	99,086 0 9	26,450 2 7	22,000 0 0	4,450 2 7
1915	262,454 10 5	85,706 11 11	32,264 16 7	22,000 0 0	10,264 16 7
1916	275,920 9 4	92,868 14 5	18,473 10 3	22,000 0 0	Nil
1917	284,443 17 10	80,217 1 5	967 0 1	Nil	967 0 1
1918	350,101 12 9	110,332 17 7	26,970 5 10	16,970 5 10	10,000 0 0
1919	425,383 12 8	130,882 14 2	42,672 2 7	25,000 0 0	17,672 2 7
1920	**495,024 14 2**	**119,527 13 4**	**37,609 12 11**	**20,000 0 0**	**11,609 12 11**
1921	542,746 10 9	108,797 7 3	16,812 10 1	6,812 10 1	10,000 0 0

A statement showing the variation in the traffic receipts, week by week during the year 1920-21, indicates that the highest weekly receipts were £12,345 for the week ended 10 March, which included a portion of Whit-week; the receipts for Whit-week amounted to £13,023 17s. 8d., as compared with £13,092 12s. 4d. during the same period in the previous year.

THE LATE ALDERMAN H. LINSLEY.

By the death of Alderman Henry Linsley, which took place at his home, Bank Place, Salford, on August 18, the Corporation—and especially the tramways department—has suffered a loss. Alderman Linsley, who passed away after a few weeks' illness, had been chairman of the Salford Tramways Committee since its inception. He was 73 years of age, and entered the Borough Council in 1886. In 1911-12 he held office as mayor. For many years he was a member of the Executive Council of the Municipal Tramways Association, and in 1913-14 he was appointed president. He continued in the office during the following year, presiding at the annual meeting held in London in September 1915. Alderman Linsley's genial personality won for him many friends, and his loss will be keenly felt by his associates on the Executive Council.

Impressive scenes marked the funeral, which took place on August 22. A large number of members of the Borough Council, Corporation officials, and colleagues representing various social and civic bodies attended, while six tramway inspectors acted as bearers.

An appreciative reference is made to the late Alderman in the editorial columns of the *Salford Reporter*. "By the death of Alderman Linsley," our contemporary says, "Salford has lost a valuable burgess. For nearly 35 years he had been a member of the Council, and in his quiet, unassuming manner had rendered great services to his town. His name will long be remembered as chairman of the Tramways Committee, which office he held from the formation of the committee. An ex-mayor, he was also a magistrate of the borough and a deputy-lieutenant of the county. As a magistrate, he held latterly the important position of chairman of the Licensing Justices. In his long and varied service the late alderman made many friends, and his devotion to duty, coupled with his unfailing good temper, gained for him the respect of all who came in contact with him."

WORKS LIBRARIES.

Under the title "Works Libraries" three papers were submitted at the meeting of the Library Association at Manchester on September 15. These were descriptive of what may be called the intelligence departments of three great industrial undertakings, the Metropolitan-Vickers Electrical Company, Limited, the Dunlop Rubber Company, Limited, and Rowntree, Limited. Mr. Pearce, of Metropolitan-Vickers, said an intelligent service in industry represented an attempt to formulate a survey of business facts in a systematic and orderly way, and to aid the technical expert who otherwise could not hope to keep abreast of new knowledge even in his own line. Although intelligence work in industrial organisations had long been carried on, the concentration of the work of acquiring and distributing knowledge in the hands of specialists in this country was a comparatively recent development. The Works Intelligence Department was essentially the intermediary between the investigator—whether technical, scientific, commercial, or statistical—and this problem. Mr. Pearce explained how, at the works of the Metropolitan-Vickers Company, the Intelligence Department helped all the others, including the management, in its dealings with a vast human personnel. The actual library of bound volumes was but a small part of its material and functions. Rather the department was a channel through which flowed information from many sources and capable of indefinite enlargement. The extension of library work into the purely economic sphere represented by such business intelligence departments had been carried out, he said, to a far greater degree in the United States than here. It was said that 600 great firms in America now installed such departments.

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RAILLESS TRACTION AT YORK.

GUESTS OF RAILLESS, LIMITED, INSPECT LATEST INSTALLATION.

In our issue of March 17, 1921, some particulars were given of a railless installation which had then recently been completed by York Corporation. As was then indicated, York is typical of many towns throughout the United Kingdom in which the present cost of permanent way construction renders prohibitive much desired extensions of the tramway system. Increased facilities, as was the case at York, are, however, urgently required. Under normal conditions of prices and industry the construction of

City Terminus: Railless Car Approaching Curb.

hundreds of miles of electric tramways would no doubt now be in progress; but in the present circumstances even the wealthiest Corporations feel the necessity of restricting capital expenditure.

The Tramways Committee of York, however, felt that something had to be done, and after thorough investigation of the possibilities, came to the conclusion that railless electric traction was the most economical system which they could adopt to increase their travelling facilities. The economic barrier to tramway construction was reinforced by the configuration of the streets. The districts in which it was desired to provide a service are approached by narrow and tortuous streets, in which it would have been impracticable to lay tramways. For these and other reasons it was decided to provide an initial installation for running railless trolley omnibuses on a route one and a quarter miles in length, commencing at the Market Square and terminating at Heworth. The line has now been in service for some ten months, and there is no doubt that the public have found the service of great convenience, while it is understood that the Corporation are well satisfied with the results.

To enable a number of their friends to inspect the working of the installation the directors of Railless, Limited, arranged a visit from London to York on August 30. Arriving early in the afternoon, the visitors were met by Alderman C. W. Shipley, chairman of the Tramways Committee, and Councillor W. H. Sessions, and were taken by special tramcar to the terminus of the railless line at Market Square, whence they were subsequently conveyed in railless cars over the route, and were afforded ample opportunity to familiarise themselves with the overhead equipment and the construction of the cars and methods of working.

Owing to the narrowness of the streets that the route traverses, the cars, which were designed and supplied by Messrs. Railless, Limited, have been constructed to the exceptionally narrow over-all width of 6 ft. 3 in. A feature of especial interest at present is that they have been designed on the one-man principle. This plan was adopted as the traffic is light, and it was felt that there could be no difficulty in the driver dealing with the passengers' fares. The entrance door of the vehicle is in front, and is under the control of the driver who sits in a closed compartment on the right, with an entrance on the off-side. On his left hand is the pay-as-you-enter device, into which fares are dropped by the passengers, who, if necessary, obtain change from the driver.

As will be seen from the accompanying illustrations, the cars are of the single-deck type, and they have seating capacity for 24 passengers. There are five seats at the back and two rows of seats arranged longitudinally, the off-side seat accommodating 10 passengers and the near-side 9 passengers.

Each trolleybus is equipped with two 23 B.H.P. motors, arranged for series parallel control. Two "Railless" patent cam-controlled trolleys are built into the front bulkhead of the body, and are so arranged as to relieve the roof of all weight. These trolleys provide a very light upward pressure of the trolley wheels against the wires, and allow the cars to deviate at full speed 17 ft. on either side of the centre of the road without the risk of dewiring. Each vehicle is fitted with hand and foot operated service brakes on the rear wheels and emergency foot brakes on the motor shafts.

The chassis is arranged for a two motor equipment, the frame being constructed of steel pressings. The springs are of the laminated type of Sheffield manufacture, and are so designed as to give easy riding under all conditions of load. The front axle is a solid steel frame, and the steering gear, of the worm and sector type, is enclosed in a dust-proof casing. The

Passengers joining City-bound Car at East Parade.

rear axle is of the direct worm-driven type, fitted with roller and ball bearings, so arranged that the weight of the vehicle is entirely taken by the casing, no weight whatever being taken by the driving shaft. Hollow spoke cast-steel road wheels are employed, mounted on flat bushes, the front wheels having single and the rear wheels twin solid rubber tyres.

Proposed Ambleside and Keswick Light Railway.—At a meeting of Westmorland County Council on September 2 the Highways Committee to whom the question of the proposed Ambleside and Keswick Light Railway had been referred by the Council reported that they had reason to believe that the Cumberland County Council were equally interested in the matter with Westmorland, and would like a conference on the question. A sub-committee was appointed to meet representatives from Cumberland, and to report to the next meeting of the Highways Committee.

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THE
Tramway and Railway World
FOUNDED IN 1892.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention Original illustrations will also be welcome.

LONDON, SEPTEMBER 15, 1921.

Standing Passengers.

The announcement by the Metropolitan Police that the concession relating to excess passengers in tramcars and omnibuses will not be withdrawn on October 1, as was intended, did not occasion much surprise. That the right course has now been adopted is generally agreed. The statutory requirements as to the number of permissible passengers are to continue suspended until the companies can put sufficient vehicles on the streets to meet the needs of the travelling public. Since the original decision to prohibit the existing practice was announced in the House of Commons, the matter has aroused considerable discussion not only in London, which is primarily concerned, but throughout the whole country. The editorial columns of the daily newspapers have been very much alive to the question, and on the whole have adopted the standpoint taken in these pages. That was, briefly, that the prohibition of excess passengers at this time was premature. The very fact that the London tramway undertakings, both municipal and company-owned, and the omnibus concerns thought necessary to protest appears to have been sufficient proof of their inability to cope with the traffic if standing must cease. As the deputation pointed out, the managements have no desire to permit any more "strap-hanging" than is absolutely necessary owing to the exigencies of the circumstances. But to insist that no more than the specified number should board a tramcar or omnibus would simply have been to create serious congestion in the streets. This would have constituted a grave embarassment in the busy thoroughfares of the City, the West End, and the main roads through the suburbs. After all it is the public as a whole whose wishes must be met, and it needs but little insight to convince anyone that the average person would much prefer to embark promptly on his journey—even though he must cling to a strap—than to wait in a crowd, exposed to street dangers, until he can get a seat. Especially is the concession desirable in the case of an urgent journey (everyone cannot afford to use a taxi), where an appointment must be kept or a train caught. It cannot be urged, on the contrary, that the fault lies with the transport undertakings in not providing sufficient vehicles; the extent to which their fleets have been augmented since the Armistice is patent, and their efforts to cope with the problem have not been relaxed. If the police authorities were right in their first assumption that "there will be sufficient transport to carry the people, even during the rush hours," surely the congestion problem would have solved itself. Yet it is painfully felt by those who use the tramcars and omnibuses in the busy hours that "strap-hanging" shows little tendency to decline. On the whole, this exhibition of ill-advised and hasty methods on the part of the police or the Home Department is not creditable. Its only useful purpose seems to have been to focus attention on the need for more rolling stock on the London streets—a state of affairs of which the transport undertakings have been quite well aware.

The Licensing of Omnibuses.

In both tramway and non-tramway areas the expiration on August 15 of Section 20 of the Local Government (Emergency Provisions) Act, 1916, brings local authorities face to face with a difficult situation. The section referred to prohibited omnibuses from plying for hire on or using any route which had not been regularly

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used within two years prior to March 1, 1916, except with the consent of the highway authority, subject to appeal against unreasonable withholding of consent or the imposition of unreasonable conditions. The position appears now to be governed by Section 37 of the Town Police Clauses Act, 1847, subject to the provisions of appeal contained in Section 14 of the Roads Act, 1920, and to Section 7 (4) of the Roads Act, 1920. The effect of the first and second mentioned sections is, according to authoritative opinion, " that whenever application is made for a licence for an omnibus to ply for hire the application will have to be considered judicially, and that unless there are valid reasons for refusing it the application must be granted without payment of any fee, there being the right of appeal to the Minister of Transport against an unreasonable or improper refusal or against unreasonable conditions attached to the grant of the licence." By Section 7 (4) of the Roads Act, 1920, the Minister of Transport is empowered by Order on the application of a county or county borough council after holding a public inquiry, to prohibit or restrict the driving of vehicles of any specified class on any specified highway within the area of the Council in any case in which it appears to him as the result of the inquiry to be proved " that a vehicle of that class cannot be used on that highway without endangering the safety of the vehicle or the persons therein, or of any other traffic using the highway, or that the highway is unsuitable for use by a vehicle of that class." A licensing authority would, no doubt, be entitled to refuse to grant a licence where there was already in their area a sufficient number of licensed vehicles of the class for which a licence is asked, or where the circumstances of the area were such that the use of the proposed vehicles would be a source of danger or would cause serious obstruction to other traffic entitled to use the roads.

Question of Competition.

On the other hand, it may be considered as practically certain that a licensing authority would not be justified in refusing a licence merely on the ground that the running of the proposed vehicle would set up competition with a service of tramways or omnibuses of the authority. While this contention is not based upon any reference to a decided case, judgment in *Rex v. Brighton Corporation* shows that the power of granting or withholding licences must be exercised in a judicial manner, and where an application is improperly refused the licensing authority can be compelled by mandamus to grant the licence. In this case a company applied for licences for omnibuses and chars-a-bancs to ply for hire within the borough, in which another company were operating omnibuses. The Corporation refused the omnibus application on the ground that owing to the narrowness of the streets the competitive running would be a source of danger to the public. The application for coach licences was rejected without giving any reason. While upholding the attitude of the Corporation so far as it related to omnibuses, the Divisional Court granted a mandamus in respect of the licence for coaches, on the ground that it appeared from the evidence the Corporation were showing annoyance at the action of the applicants in persisting in running into the town omnibuses licensed by a neighbouring authority, though only for the purpose of setting down and not taking up passengers. From the Brighton decision it would appear that upon the ground of safety a local authority has a considerable amount of protection, which is further supported if the highway is unsuitable for use by a vehicle of the class for which a licence is sought. On the latter aspect it has been maintained that unsuitability relates only to physical conditions, such as width and structural ability to bear the traffic.

Platform Fare Collection.

Now and again writers of letters in the Sheffield newspapers complain of the collection of the fares of upper deck passengers on the platform, but until recently no one connected with the tramways has ventured to reply. Nor does the matter seem to have been made the subject of a complaint at any meeting of the City Council. That being so the innovation may be regarded as having met with the approval of the passengers generally. A good case can be made out for the system, which was adopted about six years ago. It is not the practice to take the fare on the platform from every top deck passenger. The rule is enforced only at stopping places

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where not more than half a dozen persons or so are waiting. To attempt to deal with more than that number would involve delay in starting the car. The ground of objection generally advanced by the correspondents is that with a number of passengers some of them are placed in an insecure position while the car is in motion, owing to having to find the money in their pockets. The obvious remedy is that they should have the coins ready before mounting the platform. Perhaps the best argument in favour of taking the fares before the riders go aloft is that it enables the conductor to be always on the platform, where he is best able to prevent the class of accident that is most numerous on tramway cars generally. On this point it would be of interest to learn how many of these mishaps occur in Sheffield, in order to compare the figures with those of other places. Indirectly the Sheffield custom is a testimonial to the merits of the pay-as-you-enter car, which was given a trial in Leicester, Aberdeen, and Gateshead. Popular clamour—based on other considerations than the merits of the system—led to its withdrawal in the Midland and Scottish towns, but at Gateshead it is understood that at the termini the rush of passengers was too great to enable the fares to be expeditiously collected. In the Tyneside town the cars carry loads that would make the Metropolitan police gape with astonishment. Yet there is another system that would enable platform collection to be adopted anywhere without the slightest risk. This is the improvement introduced by the general manager of the Newcastle Tramways of placing the staircase within the body of the car, a plan that is also being adopted in new cars at Salford. The design is, we believe, protected, but no doubt reasonable arrangements can be made under which this method can be experimented with, and it may be hoped that before long other towns will put the several advantages of this car to the same thorough test that it has received at Newcastle.

Institute of Transport: Annual Dinner.—The second annual dinner of the Institute of Transport, which was originally fixed for April 26, will be held in the Victoria Hall, Hotel Cecil, London, W.C.2, on Monday, October 10, at 7.30 p.m. Lord Ashfield of Southwell, the president, will hold a reception before the dinner. A representative and distinguished company is expected. Applications for tickets should be addressed not later than October 4 to the Hon. Secretary, Mr. H. E. Blain, C.B.E., 2 and 3 The Sanctuary, London, S.W.1.

OIL FUEL TEST AT LEEDS.

Mr. Hamilton's Report on Comparative Cost.

The financial results of a comparative test between coal and oil fuel at the Crown Point power house of Leeds City Tramways has been presented to the Tramways Committee by the general manager, Mr. J. B. Hamilton. It will be recalled that at an early stage of the coal strike, oil fuel was introduced at the Crown Point station, with the result that the tramway service was restored to normal.

Mr. Hamilton's report states that tests were taken on July 14 and 15, between the hours of 8 p.m. and 11 p.m.—a total of six hours. Oil fuel only was used on eight boilers, seven of which are fitted with the Gretna type burner, two on each boiler, and one fitted with the Johnson type four burners. As a result of the test, ten tons of oil were used, and 11,300 units of electricity generated, giving a consumption of 1·98 lb. at a cost of 1·115d. per unit, against coal consumption of 2·859 lb. at ·560d. per unit at last year's prices. The report pointed out that in order to make a fair comparison, several deductions should be made from the works cost if oil fuel only were used. The deductions are stated in the following table at the rate per annum (shillings and pence being omitted)—

	£
Repairs and Renewals, Stoker Gear and Firebars, etc.	420
Coal Elevator Repairs	221
Wages of Firemen (5 men)	1,198
Wages of Elevator Men (3 men)	655
Wages of Labourers (4 men)	799
Saving in Oil for 71,265 units	330
Saving in Cost of Removal of Ashes	178
Saving in Boat Hire	72

The total amounts to £3,545 15s. 2d., and in addition 71 units of electricity would be saved which are now expended in the operation of stoker gear and coal elevator. The comparison of power expenses calculated on the year ended March 31 last, showing the difference in cost of oil fuel against coal fuel, are set out by Mr. Hamilton in the following table (shillings and pence being omitted)—

	Coal. Cost per K.W. Hour.		Oil. Cost per K.W. Hour.	
	d.	£	d.	£
Salaries and Wages ...	·138	8,906	·097	6,253
Fuel	·560	36,199	1·115	71,683
Water and Gas	·003	164	·003	164
Oil and Waste	·003	194	·003	194
Miscellaneous Supplies ...	·005	310	·005	310
Repairs and Renewals to –				
Steam Plant	·023	1,516	·013	874
Electrical Plant ...	·006	382	·006	382
Feeder Cables, etc. ...	·015	966	·015	966
Power and Sub-station Buildings	·002	131	·002	131
	·755	48,771	1·259	80,960

The figure given for coal under cost of fuel includes the cost of removal of ashes and boat hire.

In this table coal was taken at last year's price and oil at £5 5s. per ton. The price of oil, it is added, would have to be £2 17s. per ton to compete with good coal at £1 16s. per ton, or £2 19s. a ton to compete with coal at £1 17s. 6d. per ton.

Leeds Double-deck Railless Cars.—Leeds Tramways Committee propose to substitute double-deck railless cars on the Whitehall Road route in place of the present single-deck cars. One car has been completed, and another will be added. The double-deck cars will seat 55 passengers, or 25 more than the old cars.

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MUNICIPAL TRAMWAYS ASSOCIATION.

PROGRAMME OF THE SALFORD CONFERENCE.

Appended is the official programme of the conference of the Municipal Tramways Association to be held at Salford, September 28-30.

WEDNESDAY, SEPTEMBER 28.

10 a.m. Meeting of the Executive Council in the Technical Institute, Peel Park, Salford.

10.30 a.m. Reception by the Mayor of Salford (Alderman F. Hampson, J.P.) and the chairman and members of the Salford Corporation Tramways Committee, in the Technical Institute.

11 a.m. Conference.
Presidential address by Mr. G. W. Holford, the general manager of the Salford Corporation Tramways. A paper will afterwards be read by Mr. J. M. McElroy, general manager of the Manchester Corporation Tramways, on "Some Phases of Tramways Development in the Past, and the Outlook."
Discussion will follow.

1 p.m. Luncheon in the Town Hall, Pendleton (at the invitation of the chairman and members of the Salford Corporation Tramways Committee), to which the ladies of the party are invited.

2.30 p.m. Conference to resume.
(a) Further discussion of Mr. McElroy's paper.
(b) A paper will be read by Mr. J. B. Hamilton, C.B.E., general manager of the Leeds City Tramways, on "The Operation of Tramway and Omnibus Undertakings under Statutory Powers, in Relation to the Roads Act, 1920"
Discussion will follow.

5 p.m. Adjournment.

7.30 p.m. Conversazione at the Salford Town Hall, at the invitation of the Mayor of Salford (Alderman F. Hampson, J.P.).

THURSDAY, SEPTEMBER 29.

10 a.m. Meeting of the Executive Council in the Technical Institute, Peel Park, Salford.

10.15 a.m. Meeting of the Managers' Section.

10.45 a.m. Conference to resume.
Further discussion of Mr. Hamilton's paper. This will be followed by a paper by Mr. W. Chamberlain, general manager of the Oldham Corporation Tramways, entitled, "Permanent-Way-Public Road-Maintenance: Some Notes on the Equitable Incidence of the Cost."

1 p.m. Luncheon at the Manchester Town Hall (provided by the chairman and members of the Manchester City Tramways Committee). Cars will leave Albert Square for Peel Park at 2.30 p.m.

2.50 p.m. The official photograph will be taken at the Royal Technical Institute.

3 p.m. Annual general meeting of the Association.

7 p.m. Annual dinner of the Association at the Grand Hotel, Manchester.

FRIDAY, SEPTEMBER 30.

Excursion to Chester. Motor chars-a-bancs will be provided by the South Lancashire Tramways Company (Mr. Edwardes, general manager). The party will start from Victoria Bridge, Salford, at 10 a.m.

Luncheon will be provided at the Grosvenor Hotel, weather permitting, by the kind invitation of the Mayor of Chester (Colonel J. S. Roberts, D.L., J.P.), the Sheriff (C. P. Cockrill, Esq., J.P.), and the chairman of the Tramways Committee (Alderman John Jones, J.P.). The members of the Association paying a visit to Chester, will be entertained on the river during the afternoon.

The Channel Tunnel.—Professor Kendall, geological adviser to the Channel Tunnel Company, in an address to the York Geological Society recently, stated that there was good reason to believe that the Government was generally favourable to the Channel tunnel scheme. Plans for the tunnel have been re-drawn by Sir Douglas Fox, and it is now proposed to place it at such a depth as to render it invulnerable to submarine attacks. The method of reducing the time of construction suggested is by constructing towers in mid-Channel and using them as intermediate shafts, giving four extra faces to work at instead of two.

Sandberg's "In-situ" Rail Hardening Process.—The Scholey Construction Company, Limited, 56 Victoria Street, London, S.W., have secured a contract for the "In-situ" treatment of three-quarters of a mile of track on the South Metropolitan Tramways. A repeat order has also been received from the Wallasey Corporation Tramways for the treatment of three miles of track, making a total on this system of six miles. At the present time the Scholey Construction Company are executing contracts on the following tramway undertakings—Bradford, Glasgow, Leeds, Wallasey, Liverpool, South Metropolitan, and Newcastle.

VICTORIA ELECTRICITY SCHEME.

PREMIER AND ACCEPTANCE OF U.S. TENDER.

Further details are now available of the large contract placed by the Government of Victoria, Australia, for the supply of electrical equipment in connection with the Morwell electricity scheme adopted by the State. There were no tenders for Australian made apparatus for any part of the work, and (as recorded in our issue of May 21) the Government, on the recommendation of the Electricity Commission, accepted the tender of the International General Electric Company of the U.S.A. for the whole plant at £379,000. It is stated that this figure was £300,000 less than the lowest possible combination of British tenders.

In the course of a statement issued by the Premier, he says (according to the *Industrial Australian* of May 26)—"For all machinery, apparatus, and electrical equipment tenders have been and are to be called on usual lines, inviting proposals from all the best manufacturers wherever situated. A number of such tenders have already been received and dealt with. Up to the present the total value of the actual expenditure and commitments for future expenditure upon the several activities of the commission amount to upwards of £350,000, and this sum is distributed, roundly, as follows—(*a*) Expenditure in Australia, £156,000; (*b*) expenditure in Great Britain, £106,000; (*c*) expenditure elsewhere than within the Empire, £88,000. Included in the expenditure upon goods of British manufacture are the turbo-generators for the Newport "B" power-house, to the value of £100,000. This contract was secured, after competition, by Messrs. C. A. Parsons and Company, Heaton Works, Newcastle-on-Tyne, England. The commitments for expenditure upon plant outside of the British Empire comprise chiefly very specialised mechanical coal-winning and transportation appliances not procurable elsewhere than in the United States. Tenders have recently closed for that portion of the electrical installation comprised under the general heading of "transformers and switch gear." This includes the whole of the apparatus which transforms the electric energy from the voltage of generation at Morwell up to the voltage of transmission, also the switch gear and the electrical mechanism for operating the apparatus and all the control gear. It also includes the step-down transformers, synchronous condensers, and switchgear of the Newport terminal station, as well as apparatus for a number of metropolitan sub-stations. No tenders for Australian-made apparatus were received for any part of this work. Only three formal tenders were received, that is to say, only three tenderers were able to submit tenders for the whole of the apparatus required. The commission, however, exhaustively investigated each item in every partial or informal tender, for the purpose of ascertaining whether by selection a break-up of the tenders could be effected in the interests of the scheme. The result of this analysis only made more clear the fact that the lowest tender, that from the Australian General Electric Company (which tendered on behalf of the International General Electric Company of United States), was by far the most economical. No British tender was received for the apparatus as a whole, but a selection of the lowest proposal of each British tenderer for each separate item indicated that the lowest possible price for the apparatus required amounted, on these lines, to £680,000. It is improbable that the British tenderers would agree to the lowest items being thus picked out of each of their tenders, and those items only accepted. But even if that were possible the tender of the International General Electric Company for the whole apparatus was £379,000, or £300,000 less than the lowest possible combination of English tenders. The term of delivery offered by this company is also more satisfactory than that offered by any other tenderer, and the State Electricity Commission therefore recommended to the Government that the tender of the International General Electric Company be accepted."

BUSINESS NOTICES.

THE BRITISH INSULATED AND HELSBY CABLES, LIMITED, have issued a general descriptive catalogue dealing with cables of various types, copper wires, dynamos and boilers, pillars, fuse boxes, overhead tramway material, rail bonds, meters, welders, gauges and pinions, and a variety of other supplies. The catalogue is well illustrated.

"A.W.P." ELECTRIC ARC WELDING.—The economic value and efficiency of electric arc welding as applied to tramway and light railway tracks and rolling stock is convincingly emphasised in a booklet issued by the Alloy Welding Processes, Limited, of 14-16, Cockspur Street, S.W.1. Under the title of "Bulletin No. 40," it deals with the system in relation to permanent way, rolling stock, gear cases, truck frames, axles, and armature spindles, motor car cases, brake gear, wheels, body fittings, etc., and the types of "A.W.P." electrodes recommended for each class of work is specified.

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ENGINEERING AND MACHINERY EXHIBITION.

NOTEWORTHY DISPLAYS AT OLYMPIA.

The Shipping, Engineering, and Machinery Exhibition which is being held at Olympia, London, W., from September 7 to September 28, comprises much worthy of the attention of tramway and light railway engineers and managers. Considering the difficult times through which industry is passing, the size and scope of the exhibition is encouraging. There is much evidence of enterprising salesmanship and a host of useful demonstrations. Though a large proportion of the stands are devoted to maritime engineering, there are many which are concerned with equipment, fittings, and structural processes—especially welding—used by tramways and kindred undertakings.

At the far end of the ground floor the large stand of Brecknell, Munro and Rogers, Limited (for whom the Peckham Truck and Engineering Company, Limited, are sole selling agents), is marked by a fine display of standard overhead fittings, as approved by the Municipal Tramways Association. A number of new types of current collectors for tramways and industrial plants are also on view, including the new "Brecknell" trolley standard. This is fitted with ball and roller bearings, and an original buffer arrangement which prevents the pole from rebounding should it leave the wire. The standard, instead of having one or two large springs, has two batteries of springs, which make the arm very flexible and compensating in all its movements. The "Thomas" patent ratchet locking device for use at the bottom of the tramcar driver's brake handle, the speciality of the Peckham Truck and Engineering Company, Limited, is also to be seen.

Near the main entrance, the stand of the British Thomson-Houston Company, Limited, commands attention. Their portable master controller for cranes needs only demonstration to prove its utility. The operations of unloading and loading can be easily governed by one man from the most advantageous position anywhere within range of the crane. The apparatus is carried slung from his shoulders, and through a trailing cable he operates all movements by way of contactors installed in the crane cabin. The company's electric rivet heater is also demonstrated, the advantages of which include clean, thorough, and rapid heating with an absence of starting-up and stand-by losses. Fabroil noiseless pinions (including a notable double helical type), electric motors, B.H.T. watertight controller, pedal switch, AC switchgear, flow meters, and a portable wireless receiver are also displayed, together with representative specimens of the company's well-known lighting appliances.

The Metropolitan-Vickers Electrical Company, Limited, exhibit their "single operator" type welding generator, designed for metallic electrode welding to a maximum capacity of 175 amps. This is arranged in the form of a motor generator set. The motor starting gear and the generator control panel are mounted on iron brackets attached to the bedplate, so that the whole is entirely self-contained. Other of the firm's products to be seen are a 30 H.P. electric motor, direct-coupled to an electric winch; a 120 K.V.A. 3-phase geared lighting turbo-alternator set, and various examples of "Cosmos" electric lamps and appliances.

Agricultural and General Engineers, Limited, and branch companies have a well arranged and comprehensive selection of their familiar equipment. This embodies motors and dynamos; 1 K.W. and 2 K.W. lighting sets; 8 in. by 8 in. ammonia compressor; motor-driven Diesel compressor; 2-stage S/D air compressor; 4¼ in. by 7 in. by 5 in. 2-crank steam engine and dynamo; portable railway plant; O.G. size oil engine; 31 in. single stage turbine; 30 H.P. petrol-paraffin tractor engine, and a 5⅝ by 6½ single acting air compressor.

Hollings and Guest, Limited, are exhibiting representative types of hydraulic machinery, including their noted hydraulic tyre-fitting press, which has been supplied in large quantities to motor and tyre companies and garages all over the world. The machine on view is one of their special type No. 14 Press, for removing and fixing the solid rubber tyres of commercial vehicle wheels. It is of the latest design and construction, and is capable of dealing with the largest and heaviest makes of tyres, giving a pressure of 200 tons. Another interesting exhibit is a bending press for bending plates cold up to 6 ft. in width. Two-throw hydraulic pumps for working these machines were also on view.

Of particular interest at the stand of John I. Thornycroft and Company, Limited, is the demonstration of their oil fuel gear and sprayer, comprising a model furnace front with a fuel sprayer fitted. Oil is replaced by water for exhibition purposes. There is also a "Thornycroft" pumping and heating set for oil fuel, with an out put of 1,000 lb. of oil per hour, and a 15 B.H.P. electric power generating set for paraffin fuel.

The Electro-Mechanical Brake Company, Limited, show their unbreakable jointless and rustless grid resistances, which are much used by traction undertakings, steel works, and other concerns in connection with cranes and haulage gears. The "E.M.B." steel case controllers, embodying several features of marked utility, also take a place on the stand. The advantages of "Ferodo" patent stair treads and platform coverings for tramcars, combined with the Feroleum flanged nosings, are explained and illustrated at the stand of Ferodo, Limited. Edison accumulators, ranging in capacity from 1·5 to 450 amp. hours for various applications up to the propulsion of 5-ton electric vehicles, represent the products of Edison Accumulators, Limited, while the Empire Roller Bearings Company, Limited, rely on several practical and convincing demonstrations of their goods.

Many visitors stopped to watch the portable electric drills of Scholey and Company, Limited, in use. Their "Kutmore" type (No. 1) drives a bore of ⅜ in. at two speeds, and is easily handled. Their "Copes" boiler feed water regulator is also worthy of attention.

Allen-Liversidge, Limited, have a stand which omits nothing required for acetylene welding and metal cutting (on both high and low pressure systems). Here are also acetylene flare lamps, searchlights, lighting and heating installations, etc. Especially worth seeing is a new blowpipe for use with acetylene (under pressure) and air only—no oxygen. It is particularly useful for bonding. G. D. Peters and Company, Limited, have a good show of tramway and railway fittings, and give an admirable demonstration of the latest developments in electric arc welding.

A well-staged demonstration of a handstock "Cyc-Arc" welder is provided by Buckley, Saunders and Company, Limited. It is described as a new form of electric welding plant, in the form of an automatic machine for rapidly attaching metal studs, tubes, etc., to various forms of steel plating. Their single-operator motor generator set for arc welding is now being used in several London tramway shops, and is reported to be giving much satisfaction It is on the opposed winding principle, which enables an economy of 50 per cent. in current and weight to be effected. Other exhibits include a universal welder for spot, butt, or press welding; 15 KW-spot and butt welders, and a 15 KW. rivet heater. The Alloy Welding Processes, Limited, have also a wide range of apparatus on view. There is notably the "A.W.P." motor generator arc welding plant for one operator, particularly intended for tramway track repairs and in works where electric power connections can be installed. The output of the generator is variable by field control from 50 to 200 amps. The whole machine is enclosed in a steel cover with four inspection doors. Visitors can also see a petrol-driven electric arc welding set, entirely self-contained, and a fresh type of alternating current welding plant.

Siemens Brothers and Company, Limited, devote a large stand to their engine-room telegraphic and telephonic equipments and indicators; Babcock and Wilcox have some excellent models of their boilers; the Hoyt Metal Company, of Great Britain, Limited, present specimens of their well-known brands of anti-friction metals, while John Taylor, of Liverpool, shows Aspinall's patent governors and lubrication controls.

OMNIBUS AND FREIGHT LINES IN CALIFORNIA.

SEVEN-FOLD INCREASE IN FOUR YEARS.

A report prepared by the Secretary to the California State Railroad Commission states that "In 1917 there were approximately 100 passenger and freight lines of motor vehicles operating in California. The report for 1920 places the number at 425, but the number has increased until at the end of the fiscal year, June 30, 1921, there are not less than 700 authorised carriers of passengers, freight and baggage. The Commission have received to date reports from 425 motor vehicle operating firms up to December 31, 1920. These show that twenty of these firms had a gross annual revenue exceeding 20,000 dollars for 1920; sixteen exceeded 30,000 dollars a year; nine had more than 40,000 dollars, and one company had a gross annual receipt of 1,000,000 dollars for the year. These firms operate from six to 135 motor vehicles."

The Railroad Commission and virtually every county in the State are taking up the question of highway depreciation resulting from the operation of motor transport.

New Bridge at Sydney to Carry Tramway.—The Agent-General for New South Wales states that he has received intimation from his Government that it is proposed to invite tenders for the erection of the North Shore Bridge, spanning Sydney Harbour. The bridge will carry a railway and tramway as well as ordinary vehicular and pedestrian traffic, and will, it has been estimated, take ten years to complete. The specifications are expected to reach London about the end of November, when further notification will be made in the British and Continental Press. It is understood that the closing date for tenders will be September, 1922.

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Electrification of Railways.

FINAL REPORT OF ADVISORY COMMITTEE.

We give below the full text of Final Report which has been unanimously adopted by the Electrification of Railways Advisory Committee. This, with the Interim Report of July 12, 1920, forms the conclusions of the Committee.

The Electrification of Railways Advisory Committee was appointed by the Minister of Transport in March, 1920, to inquire into railway electrification.

The committee was constituted as follows—

Sir ALEXANDER KENNEDY, LL.D., F.R.S., Past President Inst. C.E., Past President I.Mech.E. (*Chairman*).
Sir JOHN A. F. ASPINALL, Past President Inst.C.E., Past President I.Mech.E., Consulting Mechanical Engineer, Ministry of Transport.
Mr. A. R. COOPER, M.Inst.C.E., M.Inst.T., Engineer, Metropolitan District Railway and Tube Railways, representing the London Electric Railways.
Sir PHILIP DAWSON, M.Inst.C.E., M.I.E.E., M.I.Mech.E., Messrs. Kincaid, Waller, Manville and Dawson, Consulting Engineers.
Sir ALEXANDER GIBB, G.B.E., C.B., M.Inst.C.E., M.Inst.T., Director-General of Civil Engineering, Ministry of Transport.
Mr. CHARLES H. MERZ, M.Inst.C.E., M.I.E.E., Messrs. Merz and McLellan, Consulting Engineers.
Sir PHILIP NASH, K.C.M.G., C.B., M.Inst.C.E., M.Inst.M.E., M.Inst.T., Director-General of Traffic, Ministry of Transport.
Mr. LIGHTLY SIMPSON, C.B.E., D.S.O., A.M.Inst.C.E., Chief Mechanical Engineer, Ministry of Transport.
Mr. ROGER T. SMITH, B.Sc., President I.E.E., M.Inst.C.E., M.I.Mech.E., M.Inst.T., Electrical Engineer, Great Western Railway.
Sir JOHN SNELL, M.Inst.C.E., Past President I.E.E., M.I Mech.E., Chairman of the Electricity Commission.
Sir HENRY THORNTON, K.B.E., M.Inst.C.E., M.Inst.T., General Manager and Consulting Engineer, Great Eastern Railway, representing the Railway Companies.
Mr. S. G. REDMAN, M.I.E.E., A.M.I.Mech.E. (*Secretary*)

The committee presented an interim report, dated July 12, 1920, and under date of June 30, 1921, issued its final report, the full text of which is appended.

1.—The terms of reference were as follows—

To consider and advise—

I.—Whether any regulations should be made for the purpose of ensuring that the future electrification of railways in this country is carried out to the best advantage in regard to interchange of electric locomotives and rolling stock, uniformity of equipment, and/or other matters.

II.—If any such regulations are desirable, what matters should be dealt with, and what regulations should be made.

III.—How far it is desirable, if at all, that railways or sections of railways already electrified should be altered so that they may form parts of a unified system.

Subsequently, in October, 1920, the terms of reference were extended as follows—

To consider and advise—

I.—Whether any regulations should be made to limit the drop of potential in an uninsulated return conductor on electrically operated railways.

II.—If any such regulations are desirable, what limits these should impose, and under what conditions.

2.—The committee held their first meeting on March 22, 1920, and after having had before them as witnesses representatives of the principal railway companies in this country employing or proposing to employ electric traction on their systems, and also receiving evidence from the engineers to the Swedish State Railways and the Federal State Railways of Switzerland, and from British and Continental Electrical Contractors, submitted to the Minister on July 12, 1920, an interim report containing their recommendations in respect to certain general and fundamental matters covered by their reference, which it was understood should be placed before him as early as possible.

The committee now desire to confirm the recommendations contained in their interim report, which for convenience are repeated as follows—

In respect to Reference I.

8.—The committee consider that, in order to ensure the future electrification of railways in this country being carried out to the best advantage in respect to the matters indicated in the reference, it is desirable that certain general regulations should be made for observance by the railway companies when electrifying their lines.

9.—The committee consider that these regulations should be directed specially to ensuring standardisation of those methods and appliances which are likely to prove the most satisfactory under British conditions.

10.—They consider, further, that such regulations should put no avoidable difficulties in the way of the adoption in future, with the approval of the Minister, of any improvements in methods or appliances which may from time to time become available with increasing knowledge and experience.

In respect to Reference II.

11.—In view of the desirability of the railways which are now contemplating immediate electrification knowing as soon as possible the decision of the Minister on certain fundamental matters, they recommend that regulations should be issued in accordance with the following conditions—

(i.) That in the case of those railways which have not as yet electrified any lines, as well as those which at present have electrified all or part of their lines on a direct current system, their electrification, or extended electrification, as the case may be, should be carried out on the direct current system.

(ii.) That the standard pressure of the direct current system at the sub-station busbars shall be 1,500 volts, subject to—

(*a*) The continuance of any existing 600 volt and/or 1,200 volt installations, and, subject to the approval of the Minister, of their extension.

(*b*) The adoption of half the standard voltage—750 volts—in those cases where it can be shown to the satisfaction of the Minister that advantage would arise from the use of this lower pressure.

(*c*) The adoption of higher pressures—limited to a multiple of the standard pressure—where it can be shown to the satisfaction of the Minister that sufficient advantage would accrue.

(iii.) That both overhead and rail conductor collection should be permitted, as long as the position and general design of the conductors and structures are in accordance with recommendations which will be made in a subsequent report. In that report the committee will also suggest the regulations required to ensure that locomotives and/or motor coaches shall be able, wherever it may be necessary, to run at two different voltages, e.g., 600/750 and 1,500 volts, and/or with either rail or overhead collection.

(iv.) That the generation of current for direct current lines should be alternating 3-phase at such voltage as may be desirable in each case.

(v.) That in the case of existing generating stations supplying at any frequency between 25 and 50 cycles, it is unnecessary to make any change in frequency, but that it is desirable that where any one such frequency is in general use in a particular electricity district, any new power station put down in that district for supplying a railway should adopt the frequency which has been approved by the Electricity Commissioners or is in general use in that district.

The committee desire to add on this matter that from the evidence which has been put before them, as well as their own experience, they have come to the conclusion that alternating current supplied to the sub-stations at a frequency of 50 cycles can be used for railway purposes without any detriment to railway working.

In respect to Reference III.

12.—There is only one line of any importance in Great Britain which would not come under the terms of recommendation paragraph 11 (i.) above, namely, the electrified portion of the London, Brighton and South Coast Railway system. The committee have considered with special care the very difficult questions introduced into the problem by the fact that this company long ago adopted a single-phase alternating current system for its suburban lines, and did so with a special view to the adoption of a system which at that time appeared the only one admitting of extension from London to Brighton when this extension became feasible. The general manager of the company (Sir William Forbes) has come before the committee to say that his company considers the extension to be now not only feasible but urgently desirable.

13.—The committee is bound to recognise that if the railway is allowed to electrify its main line to Brighton on its present system, there will, of necessity, have to be a change of locomotives or multiple unit stock in any cases where other companies' trains run

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over that line, and that to this extent the wished-for general interchangeability will be interfered with. They recognise, on the other hand, that to change the existing suburban equipment of the Brighton railway to a direct current system would involve a large financial expenditure, which the railway itself could not be asked to undertake and which it would be difficult to justify to the public at the present time. It has further been stated to the committee that the electrification of the main line is in this case very closely connected with that of the suburban lines on account of the necessity, on economical grounds, of using the same rolling stock throughout.

14.—Having all these considerations in mind the committee recommend, as the course which on the whole has the balance of advantages—

(i.) That the electrical system of working at present in use, or actually under construction, on the Brighton Company's suburban lines need not be changed.

(ii.) That in view of the recent proposals of the Government as to grouping of railway companies, the question of the system on which the London, Brighton and South Coast Railway Company's proposed extensions to the coast should be carried out is now—in the event of the Government's proposals being approved by Parliament—one for special consideration from the point of view of the requirements of through working and interchangeability of traffic with the other systems forming part of the proposed Southern Group. Subject to these matters receiving the fullest consideration, and provided the completion of the proposed extension on the present system shows a substantial financial advantage, the committee are of opinion that it should be allowed.

3.—The committee continued their consideration of the further matters, which, as stated in the interim report, were left over for subsequent consideration, and have again had before them representatives of the London and North Western Railway, the South Eastern and Chatham Railway, the Metropolitan Railway, the London Electric Railways, the Lancashire and Yorkshire Railway, the North Eastern Railway, the London, Brighton and South Coast Railway, the Midland Railway, and the London and South Western Railway. Mr. Leitch, formerly the electric traction engineer to the Central Argentine Railway, also gave evidence, and a report was received from Mr. George Gibbs, of Messrs. Gibbs and Hill, consulting engineers to the Pennsylvania Railroad and other railways. The published reports by Commissions appointed in Continental countries to consider the matter of railway electrification have been obtained and placed before the committee.

Sir Frank Dyson, the Astronomer Royal, and Mr. F. E. Smith, until recently the superintendent of the electrical section at the National Physical Laboratory, Teddington, gave evidence in respect to the effect on the indications of certain magnetic instruments by the operation of electric traction systems in the vicinity of the Greenwich Observatory and the National Physical Laboratory. Further evidence on the side of the electrical contractors has been given by representatives of Messrs. Brown, Boveri and Company, Baden, Switzerland.

The committee desire to put on record their indebtedness to the railway and other authorities, as well as to the Astronomer Royal and the other gentlemen mentioned above, for their very valuable assistance.

The committee, having also had before them the recommendations made by a Committee of the General Purposes and Public Safety Department with regard to the clearances to be provided for overhead conductors, now recommend, in continuation of the first portion of paragraph 11 (iii.) of the interim report, that regulations in respect to contact rail collection and overhead collection of current should be issued covering new electrical equipment operating on the recommended system.

4.—In respect to contact rail collection, it is essential for the interchange of electrically-operated trains, referred to in the first term of the reference, that the contact rails should be so placed as to enable current to be collected by the same trains both on railways employing 1,500 volts and on those employing 600/750 volts. The top-contact type of rail is that now generally in use for the present low voltages; the under-contact type of rail has also been largely used, and, in the opinion of the committee, possesses advantages in regard to interference by the accumulation of ice and snow, and also in regard to the arrangement of protection for men working on the track with higher voltages. Suitably designed shoes can be run interchangeably with either the top or under-contact type of rail. Under these circumstances, the committee are of the opinion that the contact rails employed may have either a top-contact or an under-contact surface, and they do not consider it desirable to recommend the exclusive use of either type, some varieties of which may be the subject of patents, but think that the choice in this respect should be left open, subject to the regulations below, so as not to interfere with such future improvements as are likely to be developed in either or both types.

5.—The committee consider that a standard position outside the tracks should be defined within certain limits for the contact surface of the contact rails in relation to the position and level of the running rails, and desire to recommend that in respect to new electrically-operated lines and extensions to existing lines the following regulations should be issued for securing the interchangeability of running—

(i.) The contact surface shall be in the horizontal plane.

(ii.) The gauge measured between the centre of the horizontal contact surface of contact rails and the gauge line of the nearest rail of the corresponding track shall be 1 ft. 4 in.

(iii.) The vertical height of the contact surfaces above the plane of the top table of the running rails shall be—

(*a*) For top-contact rails, 3 in.

(*b*) For under-contact rails, 1½ in.

(iv.) The vertical height of the contact rail (including, where required, the protection over the top of the rail) above the plane of the top table of the running rails shall be such as to provide the necessary clearance from the load gauges from time to time in use.

(v.) The under-contact rail, where employed, shall provide for the engagement of the contact shoe being made from the side nearest to the running rails.

(vi.) Above the level of the under-contact surface (iii.) (*b*) no part of the contact rail construction shall be at a less distance than 1 ft. 1½ in. from the gauge line of the nearest track rail, and below the level of the under-contact surface (iii.) (*b*) at a less distance than 1 ft. 7½ in. from the gauge line of the nearest track rail.

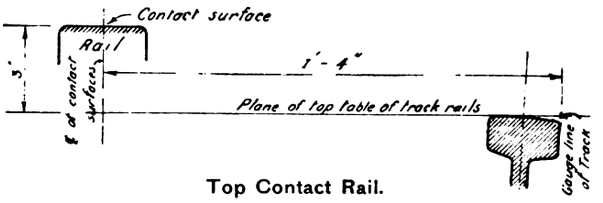
(vii.) The vertical distance between the under side of any contact shoe in the free position and the plane of the top table of the running rails shall not be less than 1½ in.

The committee recommend further that existing equipments which do not conform to the above may be continued in use, and may, subject to the approval of the Minister, be extended.

STANDARDISATION OF CONTACT RAILS.

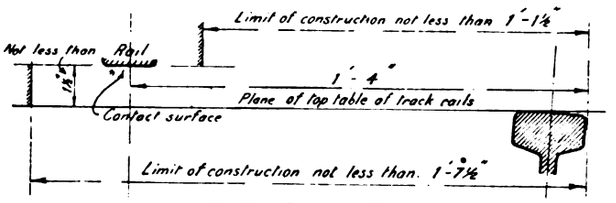
(Appendix I.).

The accompanying diagram (Appendix I.) illustrates the dimensions referred to in paragraph 5 (i.), (ii.), (iii.), (vi.), and (vii.).



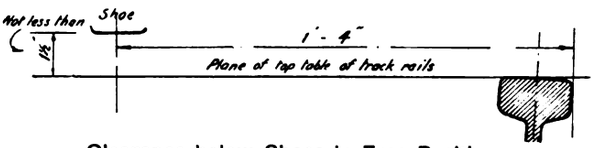
Top Contact Rail.

Refer to paragraph 5 (i.), (ii.), (iii.).



Under Contact Rail.

Refer to paragraph 5 (i.), (ii.), (iii.), (vi.).



Clearance below Shoes in Free Position.

Refer to paragraph 5 (i.), (iii.), (vii.).

6.—In respect to overhead collection, it is essential for the interchange of electrically-operated trains referred to in the first term of the reference, that the position of the overhead live wire and the clearances between the live wire and the fixed and the moving structures, as well as the width and operating range of the collector gear, shall be such that any train may collect current from all electrically-equipped railways.

7.—The committee therefore recommend that in respect to new lines and new electrical equipment of existing lines the following regulations should be issued for securing interchangeability of running—

(i.) The standard clearances, after allowance has been made for curvature and super-elevation, including any movements of

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the live wire or conductors and lateral movements of the collectors, under any circumstances likely to arise, shall be—

(*a*) Between the underside of any overhead live wire or conductor and the maximum load gauge likely to be used on the line—

(1) In the open, 3 ft.

(2) Through tunnels and under bridges, 10 in.

(*b*) Between any part of the structures and the nearest point of any live overhead wire or conductor, 6 in.

(*c*) Between rail level and overhead conductors—

(1) At accommodation and public road level crossings, 18 ft.

(2) At places where there is a likelihood of men in the conduct of their duties having to stand on the top of engines or vehicles, 20 ft.

(*d*) Between any part of the collector gear and any structure, 3 in.

The committee recommend that in the case of the electrical equipment of existing lines the dimensions stated in (*a*) (2) and (*b*) may each be reduced to 4 in. as a minimum, that cases of exceptional constructional difficulty may be considered by the Minister as special cases, and that existing equipments which do not conform to the above may be continued in use.

(ii.) The horizontal distance of the contact wire from the plane through the centre line of the track and perpendicular to the surface of the track rails shall be within the following limits—

(*a*) At a height of 18 ft. above rail level, 1 ft. 3 in.

(*b*) At a height of 4 in. above the maximum load gauge likely to be used on the line, 1 ft. 9 in.

(iii.) The weight and construction of the contact wire and supports shall be suitable for the passage of collectors exerting an upward pressure of from 25 to 40 lbs.

(iv.) The width of the renewable contact surfaces of the collectors at right angles to the track shall not be less than 4 ft., and the extreme width over the horns of the collectors shall not exceed 7 ft. 6 in.

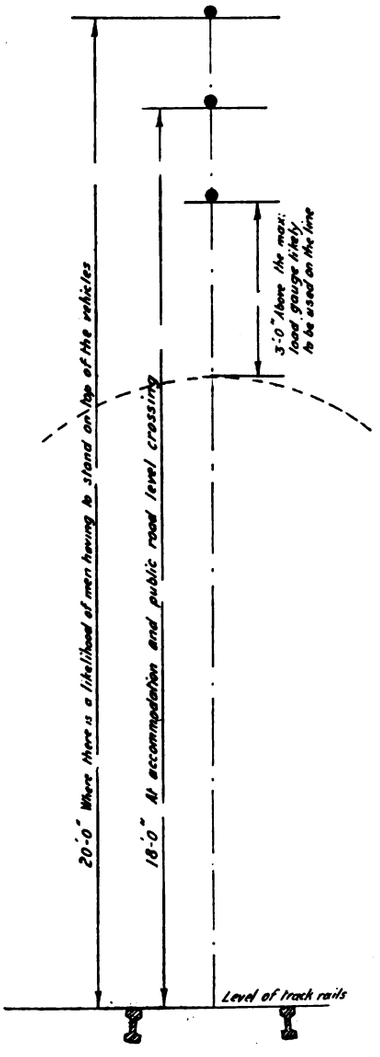
The committee recommend that in the case of those railways that have already equipped any or all of their lines with overhead contact wires which do not conform to the above recommendations, the employment of these may be continued in use and may, subject to the approval of the Minister, be extended.

The accompanying diagram (Appendix II.) illustrates the dimensions referred to in paragraph 7 (i.), (ii.), and (iv.).

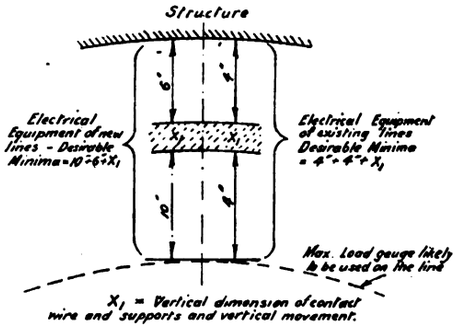
8.—With regard to the second portion of paragraph 11 (iii.) of the interim report and having regard to the practicability of further standardisation of equipment by regulations, the committee desire to confirm the views expressed in Clause 10 of the interim report to the effect " that such regulations should put no avoidable difficulties in the way of the adoption in future, with the approval of the Minister, of any improvements in methods or appliances which may from time to time become available with increasing knowledge and experience," and to add that the committee do not consider it desirable, in the interests of railway electrification, that further regulations (other than those recommended in this report) should be issued for the time being.

9.—With regard to the extended references I. and II., the committee, after careful consideration, find that—

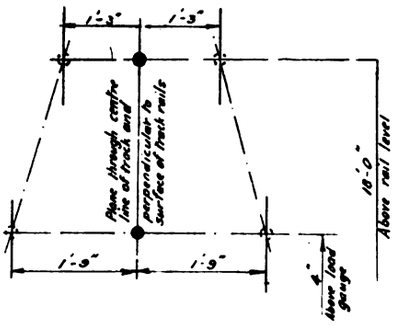
(i.) The evidence given by the railway companies operating



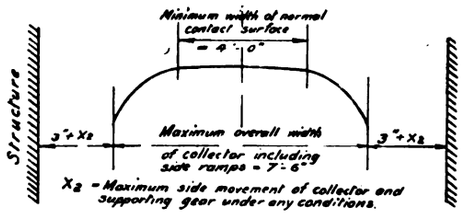
Clearance below contact wire and supports except where the track passes below overline structures.



Clearance below and above contact wire and supports where the track passes under overline structures.



Maximum variation horizontally in the position of contact wire.



Limiting dimensions and side clearances for collectors engaging with contact wire.

Appendix II.—Standardisation of Overhead Contact Wires.

Diagram illustrating recommendations in respect to overhead contact wire and collector gear.

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electric railways indicates that the cases of harmful effects due to a drop in potential substantially in excess of that allowed by Tramway Acts in earthed railway conductors have been few and unimportant, and readily corrected by the railway companies themselves on their own initiative.

(ii.) The clauses for the protection of observatories inserted in the Acts of railway companies applying for powers to operate their railways electrically have had, and continue to have, a retarding effect on railway electrification. The committee having heard in evidence officers concerned with the observatory instruments likely to be affected by the operation of electric railways, are of the opinion that the interests of observatories would in any case be sufficiently protected if the scope of the clauses referred to were limited to the portions of electric railways within the vicinity of the observatories.

(iii.) Some railways, by virtue of the wording of their Acts, are under no necessity to apply for new powers for electrifying their systems, and are therefore not placed under the disadvantages in respect to limitation in the drop of potential by their Acts as in the case of the other companies.

10.—Having regard to these considerations and to the views expressed in Clause 10 of the interim report, as well as to the difficulties in imposing any definite limit to the voltage drop owing to the variety of conditions which present themselves along different portions of any railways, the committee therefore recommend that—

(i.) It is not desirable that regulations should be issued to limit the drop of potential in an uninsulated return conductor on electrically-operated railways.

(ii.) In cases where it is found impossible to dispense altogether with the present obligations which are imposed upon railway companies by the protective clauses inserted by the Board of Trade and other authorities into the Acts of the companies, these obligations should be specified definitely in each particular case.

11.—The recommendations are briefly summarised in Appendix III.

12.—The committee desire, in concluding their work, to express their cordial recognition of the great diligence and care with which Mr. S. G. Redman has carried out his duties as secretary, and the valuable assistance which he has continuously given them.

RECOMMENDATIONS SUMMARISED.

(Appendix III.).

The various recommendations are thus summarised—

Standard System of Power Generation.—Three-phase alternating current (see Clause 11 (iv.) of interim report.)

Standard System of Power Distribution.—Direct current (see Clause 11 (i.) of interim report).

Standard Pressure.—1,500 volts at sub-station busbars ; in special cases a multiple or sub-multiple of 1,500 volts, if approved by the Minister (see Clause 11 (ii.) of interim report).

Standard Collection.—Contact rail and/or overhead contact wire (see Clause 11 (iii.) of interim report).

Contact Rail Standards.—Top-contact or under-contact rail, with the contact surface in a horizontal plane installed at a gauge of 1 ft. 4 in. from the gauge line of the nearest track rail (see Clause 5).

Overhead Contact Wire Standards.—Installed normally over the centre of the track at a height of 3 ft. above the maximum load gauge likely to be used on the line, and at a maximum height of 20 ft. above track rail level. (see Clause 7)

Limitation of Drop in Earthed Return Conductors.—No regulations to be issued (see Clause 10).

MANCHESTER AND SALFORD TRAMWAYS.

Employees' Wages and Union Membership.

At a mass meeting of Manchester and Salford tramway employees on August 28, the national wage reduction of 3s. a week was discussed. They decided to ask the National Joint Industrial Council to hold a special meeting as soon as possible to deal with their claim that the reduction shall not apply to them until their wages are on a level with those paid in places of comparable size. The Manchester Corporation Tramways Committee had previously passed a resolution urging that an early meeting of the National Council should be called to decide the question of procedure. The men's meeting also dealt with the matter of tramway employees who are not members of the union—stated to be only five in number. An earlier ballot revealed a majority in favour of strike action being taken to compel the few exceptions to come into line. Mr. J. M. McElroy, general manager of the Manchester system, has stated that there was no desire on the part of the committee to break faith with their employees. A committee of the National Council was dealing with the question of standardisation for the whole country, and when that work was accomplished the committee would take the same stand they took in 1920—namely, that the Manchester workers must stand on an equality with comparable localities. It was a question of procedure, Mr. McElroy added, and as members of the national body they must adhere to the regulations laid down, and not deal with the question locally.

Salford Employees' Strike.

Salford Corporation tramway employees came out on strike on Monday, September 12. The Tramways Committee had received a deputation from a section of their employees on August 30 in connection with a dispute arising from the intention of sixteen inspectors to withdraw from the men's union—a proposal which the men resented. The committee declined to intervene, and held that it is not their function to interfere in matters of domestic organisation among their employees. The inspectors withdrew from the United Vehicle Workers' Union, which hitherto has represented all grades of tramway servants, in order to enter the National Association of Local Government Officers. It was stated that the men feared that if the inspectors changed their union, promotion from the ranks would be stopped, and that if strike action were attempted in any dispute it would be made ineffective by the inspectors working a reduced service. The Tramways Committee specifically repudiated allegations that inducements were held out to the inspectors to encourage their withdrawal from the men's union. A ballot of the men who are union members resulted in favour of strike action being taken should the inspectors adhere to their intention. Efforts on the part of the mayor and the Tramways Committee to effect a settlement failed, and in accordance with a week's notice which the men had tendered, they came out on strike on September 12 as stated. The borough was accordingly left without a car service, though privately-owned motor coaches helped to relieve the public inconvenience.

STANDING IN TRAMCARS AND OMNIBUSES.

Prohibition Order Suspended.

It was announced on September 7 that the Commissioner of Police has decided to allow standing in omnibuses and tramcars in the Metropolitan Police District, which was to have ceased on October 1. The continuance of the concession is stated to be granted pending the provision of sufficient vehicles to meet the needs of the travelling public. It will be recalled that following the original announcement of the prohibition by the Under-Secretary for the Home Department in the House of Commons on August 15, much opposition was expressed, culminating in a deputation from London tramway and omnibus undertakings to the police authorities on September 1. The view was taken in these pages that the Police Commissioner's decision was at least premature, and that in the public interest it should not be enforced.

The deputation referred to above was received by Mr. Frank Elliott, the Assistant Police Commissioner (on behalf of the Commissioner) at Scotland Yard. The delegates represented the street-transport undertakings of the Greater London area, and the spokesmen were Mr. H. E. Blain, for the omnibus companies, Mr. A. L. C. Fell, for the municipal tramway undertakings, and Mr. A. V. Mason, for the company-owned tramway undertakings.

It was pointed out that from the public standpoint the congestion in the streets of London would be very greatly accentuated, and such streets as Fleet Street, Cheapside, the Strand, Oxford Street, and many of the main roads iu the suburbs would become practically impassable for other vehicles. The public would inevitably be seriously inconvenienced, as, speaking generally, the standing accommodation was only used by individual passengers for comparatively short distances, and was of great convenience for enabling trains to be caught and engagements fulfilled. The travelling habit in London had grown to such an extent that it was now greater than in any city in the world, and it was suggested that in no other city was a higher attempt made to cope with the rush hour traffic. This period was roughly one hour and a half in the morning and two hours in the evening, although there were other periods in different parts of London when temporary pressure arose, particularly in connection with theatres, etc. The carrying undertakings in London had made great strides in the provision of additional accommodation since the termination of the war, and there was no desire on their part to have any more standing facilities than were absolutely necessary owing to the exigencies of the circumstances. No undertaking could possibly operate vehicles for a period of three and a half hours a day, and in the case of tramway undertakings this could only be done by an enormous additional cost in the provision of extra electrical power cables and sub-stations.

The deputation was assured by Mr. Elliott that careful consideration would be given by the police authorities to the representations which had been made.

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CROSS ROAD STAY WIRES.

The Tramway Associations have received the following letter from the Minister of Transport dated July 21—

With reference to the meeting between officers of the Ministry of Transport and the General Post Office and representatives of the Tramways and Light Railways Association and the Municipal Tramways Association, held at this office on June 27, I am directed by the Minister of Transport to acquaint you with the following decisions on the points discussed, which were referred to at the close of the meeting in question—

(1) The expression "other wires" in the relevant regulation is held to cover over-road post-office stay wires.

(2) The use by the General Post-office of over-road stay wires is, in the interests of all concerned, to be deprecated unless it is clear that no possible alternative to such stays exists.

(3) Where over-road stays are on this understanding unavoidable, it is considered that in the interests of the public some precaution against danger arising from contact between over-road stay wires and overhead trolley wire is necessary.

(4) The following alternative methods of protection would be acceptable—

(*a*) That afforded by covering stay wires with some insulating material, so as to obviate electrical contact with the trolley wire.

(*b*) The earthing of each end of such wires to tramway rail.

A third possible safeguard would be the erection of guard wiring, but in view of the expenses of the maintenance of guard wires and the liabilities to damage from de-wired trolley heads and other considerations, it is considered that from all points of view such an arrangement would be the least satisfactory, and should therefore only be adopted in the last resort.

It is for consideration therefore between the General Post-office and the tramway undertakings as to which of the two alternatives, (*a*) or (*b*), above should be used, the former being considered preferable if found to be practicable.

I am to add that it is desirable that the expedient of covering stay wires should be tried as opportunity arises, and that the cases at Wakefield which have formed the subject of the recent correspondence would appear to afford a convenient opportunity.

MISTAKES IN FARE COLLECTION.

To the Editor of THE TRAMWAY AND RAILWAY WORLD.

Sir—In these days the most important of the conductor's duties has often to be performed in so great a hurry and in such densely crowded cars that occasional mistakes are almost inevitable, resulting frequently in an unpleasant ruffling of the serenity of himself and the passenger. Nor are passengers altogether exempt from similar errors. Yet by taking a simple precaution it is possible for both conductor and passenger to avoid the unpleasantness that in its absence now and again ensues. On one occasion a passenger who had tendered a two-shilling piece received change as from a shilling. Notwithstanding that the passenger pointed out the coin he had handed the conductor was quite new, the conductor was certain that he had received a shilling. The passenger suggested that the collector should search his bag, and near the end of the journey the conductor returned, and, with an apology, handed over the shilling to the passenger. On another occasion a passenger in an omnibus remarked, a minute or so after receiving change, that the conductor had given her change from a shilling whereas she had handed him only sixpence. The conductor refused to take back the balance, giving a reason not audible to the writer why he was certain that he was handed a shilling. Not infrequently it happens that incidents of the first-mentioned description give rise to stormy sequels, and sometimes to county court proceedings. In such an event the conductor has to rely upon the depot counting of his cash bag if he has handed in his money intact. In a conversation that followed the return of the shilling due to the first-mentioned passenger, the latter suggested that by the adoption of the system prevalent in business establishments and railway booking offices the risk of error could be obviated. Usually the cashier states the denomination of the coin tendered, and as an additional safeguard leaves the coin lying on the inside desk until the customer has counted the change. To the suggestion that the conductor should name the value of the coin he receives, the latter raised the objection that all his time was taken up gathering the fares and "throwing" the change at the passenger. On the occasion referred to, however, passengers were few in number. Occasionally one meets with careful passengers who guard against mistakes by themselves naming the coin from which they desire change. It would be to the advantage of all concerned if conductors were instructed to adopt that course as a standing practice.—Yours faithfully,

A TRAMWAY USER.

BRADFORD GOODS TRANSPORT PROJECT.

HEAVY LOADS ON TRAMWAYS PROPOSED.

Bradford Corporation propose, in their next Parliamentary Bill, to seek authority to increase considerably their goods-carrying powers on the city tramways. At present these powers are limited on certain routes to goods of not more than 56 lb. weight, but the new proposal is that loads from ten to twenty tons should be admissible. The goods transport of the city, by horsed vehicles and motor lorries, is a difficult and expensive problem at present, largely owing to the fact that the centre of Bradford is in a hollow. It is suggested that the tramway system could be used for taking coal to factories, and for conveying their products to the railway sidings. By this means cheaper and more expeditious local transport is foreshadowed. Dublin is the only other city in the United Kingdom which uses its tramways fully for goods transport.

Mr. Herbert Fleming, manager of the Bradford Corporation Tramways Parcels Department, in an interview published in the *Yorkshire Observer*, said that at present the powers of the department limited it to carrying a weight of not more than 56 lb. on many routes. This was a consequence of the fact that when, in 1910, the Corporation sought power to run railless trolley cars and to extend their parcel-carrying powers, they were opposed by horse owners and the railway companies, with the result that a compromise was effected, the Corporation agreeing not to carry heavier loads than 56 lb. on certain routes, among them being Undercliffe—Greengates, Nab Wood—Crossflats, and Wyke—Bailiff Bridge.

"The possibility of dealing with coal when we have full powers is obvious," Mr. Fleming said. "Take, first, the householder. He has at present to pay a tremendous price for the cartage of coal. As much as 13s. 6d. a ton has been charged. If we have power to run into the coal shoots we could take coal up in bulk—ten or twenty tons would be an ordinary load—to a field, say, at Undercliffe, to which we would run a track from the terminus. A wharf could be built there and the contents of the truck tipped out automatically. The 'collar work' would be done; the rest could be left to the coal dealers, who would distribute from there. We should have saved the carting of coal, a ton at a time in a horse wagon, or three tons at a time in a lorry, up the hills that lead out of the city. By every road you take out of the centre of the city you must go uphill. Cartage must necessarily be expensive. But we have the power in the overhead wires, and it could do the work very cheaply."

Discussing the case of manufacturing concerns who consume a considerable quantity of coal, Mr. Fleming pointed out that there were scores of such firms on or near the tramway routes. "Their coal," he proceeded, "could be taken by a tramway vehicle from the railway coal 'drops' and shot right into an automatic feed at the factory. The firm would not have to handle it at all. Then, on the return journey, the wagons could be filled with merchandise for rail, which could be handled over to the railway companies in the railway yard. There would be no need to run empty. At present firms have a private siding on the railway for which they pay. Why not have a tramway siding on the same basis?"

As regards the hours at which such a service would be run, Mr. Fleming suggested that it could be sandwiched in between the ordinary services or conducted at night. The former, he said, would be the better, as a night service would involve the firms concerned keeping a night staff for delivery and despatch. For some firms it would be possible to take coal in railway trucks carried on top of a low bogey that fitted the tramway lines. There was no reason why the disadvantage of the steepness of the roads that lead out of Bradford should not be countered by making full use of the electricity supplied by the tramways department. He referred to the Queensbury Road, which is steep for a mile and a half out of the city, and the Shelf Road, which is similar, and asserted that the power available could take a load of 100 tons, if necessary. It could carry 40 tons up Church Bank—another steep gradient. The scheme, Mr. Fleming added, would solve the transport difficulties of firms which have been obliged to settle on the outskirts of the town.

New Manchester Tramway Route.—The laying of a new line by Manchester Corporation Tramways along Seymour Grove will shortly be completed, and will result in a regular car service between Upper Chorlton Road, Seymour Grove, and Talbot Road. Residents of Chorlton-cum-Hardy and Whalley Range will chiefly benefit.

Wigan Tramways Favour Electric Welding.—So successful has been the use of electrical welding equipment acquired by Wigan Corporation Tramways that the department have asked for a second one for the repair of damaged cars. The first plant was of the R.W.B. type, supplied by the Electrical Apparatus Export Corporation, of 408-9, Bank Chambers, High Holborn, London, W.C., and this company has now supplied the second machine.

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NEW SANDING DEVICE.

WIGAN ENGINE DRIVER'S INVENTION.

A new method of sanding the rails of tramways and railways has been invented and patented by Mr. James Southworth, of Wigan, an engine driver in the service of the Lancashire and Yorkshire Railway Company. It provides for the delivery on to the rails of a semi-liquid mixture of sand and water, and is so constructed as to obviate the tendency of damp sand to arch in the sand box or to form a stoppage in the pipe. The possibility of the mixture freezing is also provided against. The water is introduced at the top of the sand box, the quantity being automatically regulated by valves, so as to produce the semi-liquid mixture. There are also devices for sieving the sand in the box, and for heating the sand mixture and pipe in cold weather.

It is claimed that by abolishing the necessity for sifting and drying the sand prior to its use, the invention will effect considerable economies, as raw sand can be used without any preparation. Mr. Hughes, chief mechanical engineer of the Lancashire and Yorkshire Railway, and of the London and North Western Railway, has taken an interest in the invention, and an engine has been fitted with the new apparatus at the Lancashire and Yorkshire Railway Company's locomotive sheds at Wigan, where demonstrations have been successfully made.

The inventor has served with the Lancashire and Yorkshire Railway Company for some 38 years, and has previously shown his inventive faculty. On two occasions safety devices which he originated have received consideration from the company's engineering officials. Mr. Southworth is a member of the Institute of Patentees, which has taken much interest in his latest production.

PROPOSED YORKSHIRE LIGHT RAILWAY.

LOCAL COUNCIL'S AMBITIOUS TRAMWAY SCHEME.

Notable light railway developments in Yorkshire are likely to follow the confirmation by the Minister of Transport of the Dearne District Light Railways Amendment Order. The Order, which was sought by the Urban District Councils of Wath, Wombwell, Bolton-upon-Dearne, and Thurnscoe, has received the approval of the Light Railway Commissioners after nearly eight years of controversy between the promoters and certain opposing parties. The local authorities named endeavoured, as far back as 1913, to obtain powers enabling them to construct what will, in effect, be tramways over some 18 miles of the roads in the district between Barnsley and Mexborough. The area is largely devoted to mining and other industries. A very protracted hearing before the Commissioners resulted in an Order being granted in November, 1915, in which the project was generally approved. The railway companies which cater for the district were not, however, satisfied and strenuously obstructed the scheme.

The Amendment Order now granted sanctions the construction of track to link the present Barnsley tramways with Wath, *via* Wombwell, and a branch northward to Thurnscoe, *via* Bolton-upon-Dearne and Goldthorpe. In a southerly direction a connection will be made at Swinton with the Mexborough and Swinton tramways. Other subsidiary lines approved are those from Wombwell towards Darfield and from Wath to Wath Staithe. The present Order not only resuscitates the powers conferred in 1915, but raises the borrowing powers of the local councils from £150,000 to £300,000. and increases the maximum fares and rates chargeable on the system. A change has been made in respect of one section of the proposed route, which has been abandoned and another line substituted. The most important of the routes decided upon, it may be noted, are already served by motor omnibuses.

York Tramway Improvement.—A new double track curve at the junction of Rougier Street and Lendal Bridge Road, York, is now being completed. This will facilitate more economic operation, relieve congestion, and incidentally improve a dangerous corner.

Proposed Glasgow Light Railway.—The Corporation Tramways Committee have agreed to recommend, as suggested by the general manager (Mr. J. Dalrymple), that in connection with the proposed extension from Baillieston to Coatbridge, a light railway, 22 ft. in width, should be constructed at the south side of the existing roadway. The construction would involve the purchase of ground to the extent of from 10 ft. to 12 ft. in width along that side of the road, or a total area of 3½ acres, the estimated cost of the scheme being £140,000. The County Council and other parties interested will be communicated with in connection with the proposal. Tramway facilities, which are to be provided in connection with the new housing scheme at Mosspark, will involve an extension of the system from the present terminus at Dumbreck to a suitable point at Mosspark.

FINANCIAL REPORTS AND MEETINGS.

HONG KONG TRAMWAYS COMPANY have declared an interim dividend of 1s. per share.

LANARKSHIRE TRAMWAYS COMPANY announced an interim dividend for the half year at the rate of 6 per cent., less tax.

THE BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY announced an interim dividend of 3½ per cent., free of tax, on the ordinary preferred stock.

MAIDSTONE CORPORATION TRAMWAYS.—The accounts for the year ended March 31 last show a loss of £122, or slightly less than the deficit in previous years.

SWINDON CORPORATION TRAMWAYS.—The loss on the tramways for the last financial year amounted to £1,512. On the electricity undertaking there was a profit of £6,600.

BOLCKOW, VAUGHAN AND COMPANY declared a final dividend on the ordinary shares for the year ended June 30 of 4 per cent. per annum, less tax. This is in addition to the interim dividend paid in March last.

STEWARTS AND LLOYDS, LIMITED, have declared the interim dividend for the half-year ended June 30, 1921, at the rate of 6 per cent. per annum on preference shares, and at the rate of 10 per cent. per annum on preferred ordinary shares.

W. T. HENLEY'S TELEGRAPH WORKS COMPANY.—A dividend has been declared on the preference shares at the rate of 4½ per cent. per annum, less income tax, for the half-year ended June 30 last, and an interim dividend on the ordinary shares of 1s. per share, less income tax.

ABERDEEN SUBURBAN TRAMWAYS COMPANY.—The profit for the half-year ended July 31, 1921, was £1,771, plus £3,808 brought in, making £5,579. The directors propose placing £1,000 to renewal and depreciation account, making it £22,300, and dividend at the rate of 7 per cent. for the year, carrying forward £2,292.

CAMMELL LAIRD AND COMPANY, LIMITED.—Owing to the long continuance of the coal strike and the uncertainty of the trade outlook, the directors have decided not to make any interim dividend distribution on the ordinary shares. An interim dividend of 2 per cent., less tax, on the preference shares has been declared.

SOUTHLAND (N.Z.) ELECTRIC POWER BOARD.—The issue of £750,000 6 per cent. debentures by the County of Southland Electric Power Board, which was announced on August 24, was immediately over-subscribed and the list for London was closed at 11 a.m. on that day. The debentures are unconditionally guaranteed both as to principal and interest by the New Zealand Government.

FERODO, LIMITED.—The net profits of Ferodo, Limited, for the year ended June 30, after charging depreciation and providing for excess profits duty and Corporation tax, amounting to £26,489, and including £3,782 brought in, show an available balance of £30,271, out of which the directors recommend the payment of a dividend of 12½ per cent., less tax, on the ordinary shares for the year, and an additional dividend of 3 per cent. per annum, less tax, on the preference shares, carrying forward £3,688.

LIVERPOOL OVERHEAD RAILWAY COMPANY.—The directors have announced with regret that they do not see their way to declare an interim dividend on the preference or ordinary shares. The control of the railway by the Government ceased as from August 15, and owing to the present state of trade, and the consequent serious loss of revenue to the company, coupled with the enormous increase in working expenses, the directors find it impossible to forecast the financial results for the remainder of the year.

WALTER SCOTT, LIMITED.—The profits for the past year amounted to £47,008, and £13,879 was brought forward, while £35,594, surplus provision for taxes was brought into account. A final dividend of 5 per cent. on the ordinary shares was proposed, making 7½ per cent. for the twelve months. The reserve fund will be increased by £32,531 and £10,826 carried forward. The directors stated that the coal strike seriously affected the year's work and the effects of the severe trade depression have been greatly felt.

PORTSMOUTH CORPORATION TRAMWAYS.—The accounts for the year ended March 31 show that the revenue on the cars amounted to £253,465, as compared with £214,374, in the previous year an increase of £39,091. The expenditure was £260,757, as compared with £226,510, an increase of £34,247. The deficit on the year's work was £7,292, as compared with £12,136. With regard to the omnibuses, the revenue had increased from £6,716 in 1920 to £16,826 in 1921, but the expenditure had also increased from £9,804 to £22,475. The deficit was £5,649, as compared with £3,088 last year. The total deficit, less interest on credit bank balances, on the whole undertaking, was £12,226, as compared with £14,020 the previous year.

BIRKENHEAD CORPORATION TRAMWAYS.—In his report for the year ending March 31 last, the general manager (Mr. C. Clarke)

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states that the total income amounted to £152,304, as compared with £148,179 in the previous year, and the operating expenses to £116,060 (against £100,476). The net profit was £4,033, as compared with £16,104. The sum of £3,021 has been allocated in relief of rates, and the remainder to the renewals fund and capital account. The decrease in profit is attributed to higher operating expenses due to increased cost of labour and materials. A gross profit of £3,660 was made on the motor omnibuses, which, after deducting £2,410 for interest and sinking fund charges, left £1,250 for the relief of rates. During the year 22,182,390 passengers were carried of whom 1,443,315 used the omnibuses. This total shows a decrease on the previous year of 653,644.

Tyneside Tramways and Tramroad Company, Limited.—The directors report for the half-year ended June 30, 1921, states that the surplus of receipts over expenses was £4,787, which, with the balance brought forward from last half-year of £488, makes a total to the credit of profit and loss account of £5,275. After deducting interest on mortgages, loans, etc., amounting to £2,025, there remains an available balance of £3,249. The directors propose payment of a dividend on the preference shares at the rate of 5 per cent. per annum (less income tax), £601 ; a dividend on the ordinary shares at the rate of 3 per cent. per annum (less income tax), £2,008 ; placing to the credit of reserve for renewals, depreciation, and other contingencies, £500 ; carrying forward to next half-year, £140. The traffic receipts show an increase of £1,180 as compared with the corresponding period of last year.

Calcutta Tramways Company.—The revenue for 1920, including interest on investments and deposits, less tax, was £222,121, plus £55,959 brought in, making £278,080, less debenture stock interest £15,750. Preference share dividend £12,500, interim dividend on ordinary shares of 3s. 6d. per share, free of tax, £24,081, excess profits duty, 1919, £36,672, leaving £189,075. The directors propose final dividend of 3s. 6d. per share, making 7 per cent., free of tax, placing to reserve for depreciation £40,000, to taxation reserve £60,000, to staff provident fund £2,402, carrying forward, subject to Indian super-tax, £42,591. Reserve for depreciation will stand at £144,619. The full effect of increased salaries and wages made in 1920 will not be felt until the current year, and to meet these increased charges it has been necessary to consider the adoption of a scheme for a higher scale of fares.

Aberdeen Corporation Tramways.—The annual report of the general manager and engineer (Mr. W. Forbes) for the year ended May 31 shows that the receipts, £191,470, were again a record. This is an increase of £21,739 compared with the previous year. The working expenses of the tramways, amounting to £157,585, show an increase of £15,734. The gross profit, £33,885, is £6,006 more than the previous year. A sum of £23,832 is set aside for depreciation and renewals, and this, with the allowances for sinking fund, interest, etc., leaves a net profit of £1,581. The total revenue from motor omnibuses was £3,842, working expenses were £2,964, leaving a gross profit of £877, from which £115 has been deducted for interest on charges. The net profit is £762, making a total profit of £2,343 for the tramways and omnibuses, which is carried to reserve. A sum of £26,099 was spent on new cars, omnibuses, and motor coaches. The amount set aside for sinking fund is £6,767.

Rangoon Electric Supply and Tramway Company, Limited.—The gross trading profits were about £98,000, or an increase on the previous year of nearly £9,000. A saving of £10,000 was due to the transfer of the control of the company from London to Rangoon, and the escape from the heavy English taxation. This sum was sufficient to pay a dividend of some £5½ per cent. on the present ordinary capital of the company. The result of the profit and loss account showed a net profit of £37,642, which was some £10,000 better than for the previous year. There was carried forward from last year £4,360, which brought up the available profits to £42,000. The tramways carried two million more passengers in the year than in the previous year. Twenty new cars were added to the rolling stock, and very probably further additions would be necessary. A dividend at the rate of 6 per cent. on the preference shares and at the rate of one rupee eight annas per share, free of Indian income tax, was declared.

Wigan Tramways Position.—At a meeting of the General Purposes Committee of Wigan Corporation, Councillor J. Cavey (chairman of the Tramways Committee) made a statement on the financial position of the undertaking. He said he had no fault to find with the decision that the report for the year 1920-21 should be taken back for further consideration, because the result of the working was of a very serious character. When they realised that in 1919-20 they finished with a profit of £16,000, and then had a deficit, including that on omnibus services, etc., of about £25,000, it was indeed serious. He confessed he did not see many items on which any saving could be effected. The increased wages to workmen in the year amounted to £8,955. Current cost them £8,534 more, and rates and taxes £2,286 more. Cars cost them £9,589 more than the previous year, and the cost on permanent way went up by £3,995. During the year under review there had been a steady increase in number of passengers and in revenue from fares.

Southampton Corporation Tramways.—The report for the year ended March 31 last shows that the total revenue of the department constituted a record—£179,988. The traffic receipts of both tramcars and omnibuses were £176,100, against £152,600, an increase of £23,499. The tramcar receipts were £163,755, an increase of £16,662. There was a decrease of 3,704,549 in the number of passengers carried, and the miles run were 22,522 less. As regarded the omnibuses, the traffic receipts were £12,344, an increase of £6,837, and the passengers numbered 1,341,913, an increase of 696,571. The miles run increased by 85,439. Receipts from advertising amounted to £1,179. There was a deficiency of £9,688 on the year's working. Thirty cars have been overhauled and repainted during the year, and a new petrol-driven tower-wagon has been added to the rolling stock, the body of which was designed and built in the department's workshops. Three saloon-type omnibus bodies were designed and built in the workshops. The motor service between Woolston and Bitterne was operated for two months, and had to be withdrawn owing to the unsuitability of the roads. The Tanner's Brook Floating Bridge omnibus service was suspended on March 28 owing to the continued falling off in traffic.

West Ham Corporation Tramways.—The report of the general manager (Mr. Lewis Slattery) for the year ended March 31, 1921, covers a great variety of information, and should enable the Council and ratepayers to obtain a very good idea of the progress of the undertaking. The general manager states that the total traffic revenue, subject to through running adjustments, for the year amounted to £305,841, an increase of £27,807, and a record in the history of the undertaking. Unfortunately there was an increase of £47,038 in working expenses, bringing the total to £298,520. After meeting all charges other than capital, there was a gross profit of £8,253, equivalent to 1·48 per cent. on the capital of the undertaking. After meeting capital charges, there was a deficiency of £22,506 (as against an estimated deficiency of £23,047), and this compares with a surplus of £1,700 for the previous year. These figures are exclusive of the cost of track reconstruction. The average earnings per car-mile were 21·48d. as compared with 21·27d. From April 1 to September 25, 1920, the average was 20·34d. per car-mile, and for the rest of the year, during which increased fares were in operation, the average was 22·67d. per car-mile, showing that the new fares materially increased the revenue. Traffic expenses showed an increase of £20,351, mainly due to increases in wages and rates. For the seventeen years since the undertaking was inaugurated there has been a total net profit of £22,671, while £35,784 has been given to the relief of rates, and the rate contribution amounted to £100,899. The total electrical energy consumed amounted to 6,087,148 units. The average price of current per car-mile was 1·78d. per unit, as against the pre-war price of 0·75d. per unit. The officials and staff of the tramways department at March 31, 1921, aggregated 1,099.

Manchester Corporation Tramways.—The annual report shows a gross profit for the year of £305,834, as compared with £379,632 for the previous year. For the first time since 1902 there has been no contribution towards relief of the rates. In 1902 that contribution amounted to £20,000, in 1910 it had increased to £75,000, and by the year ended March, 1920, to £111,891. In those 19 years the total amount thus saved was £1,438,872. In 1902 the track in use was a little over 20 miles in length ; in 1920 it was over 195 miles long. In the same period the number of passengers carried rose from 23½ millions to over 285 millions. The parcels carried in 1907 number 141,715, and 1,111,332 in 1920. By last March the length of track had increased to nearly 200 miles, but seven million passengers fewer were carried than in 1920 and 1,715 fewer parcels. The revenue produced amounted to £1,813,401, as compared with £1,586,863 in the preceding year, and the working expenses to £1,507,566, as against £1,207,230. Of the balance of £124,428 left after meeting other charges, £106,165 is set aside for renewals and the rest for income tax. In June and July, owing to the increase in the cost of operation, the penny stage was reduced from two miles to a mile and a half, but the revenue resulting was not sufficient, and in September and October there was a further reduction to a mile and a quarter. Whilst the average fare paid per passenger showed an increase of 49 per cent., as compared with 1914, the average total cost per car mile showed an increase of 129 per cent. On the average last year each car ran 86 miles per day, as against 89 in the preceding year. The number of passengers carried was equivalent to each individual in the city having made 278 journeys, as compared with 285 in the twelve months ended March last year. The penny fares represented 42·96 per cent. of the passengers, and the three-half-penny 22·46 per cent.

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TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDEEN.

FREE TRAVELLING FOR THE BLIND.

The free travelling facilities for the blind, granted in respect of the Corporation tramcars, has been extended to the motor omnibuses.

BELFAST.

TRACK RECONSTRUCTION STARTS.

Work was commenced on August 4 on the reconstruction of the track of the City Tramways. As recorded in our issue of June 25, the contract, amounting to £200,000, is for relaying about ten miles of track. Employment is being given to unemployed ex-service men applying for unskilled work, and who have been resident in the city for one year. All men taken on must come through the Unemployment Exchanges. About 250 men engaged in the work went on strike on August 30, in consequence of a notification that on September 1 their wages would be reduced from 1s. 4d. to 1s. 2d. per hour. The men comprise platers and labourers, and are in the employ of the Consolidated Construction Company, of London, who are carrying out the contract. The trouble was settled by the City Council deciding to regard the men as "expert labourers" at 1s. 4d. per hour.

BIRKENHEAD.

MANAGER'S REPORT ON TRAFFIC PROBLEM.

In a report on the financial position of the Birkenhead Corporation Tramways, the general manager, Mr. C. Clarke, states that now that the effect of the industrial prosperity created locally by the war has ended, the number of passengers being carried is falling, with the natural consequence that one of three things must happen, either (1) Working expenses must drop in proportion to the small number of passengers; (2) a loss must take the place of previous profits; or (3) the smaller number of passengers must pay higher fares. The accounts for the quarter ending June 30 showed a loss of upwards of £5,000. As reported in a previous issue, the Town Council has effected on a general revision of fares and stages.

BIRMINGHAM.

RAILLESS CARS—POLICE AND TRAMCAR QUEUES.

Railless, Limited, of 56 Moorgate Street, London, E.C., have received an order for twelve railless cars from the Corporation. It will be remembered that the Corporation recently decided to discontinue the tramway service on the Nechells route and to substitute railless traction. The cars now ordered will be used for this route, which is expected to be ready for operation in a few months.—Summonses were heard at the police court on August 11 which the prosecuting solicitor described as the first arising out of an understanding between the police and the Tramways Department to put a stop to the practice of motorists who drive recklessly through crowds of people waiting to board or leaving tramcars. Two motor cyclists were summoned for driving to the danger of the public. In one case, a tramcar driver stated that, despite his warning, defendant dashed through the disembarking passengers, several of whom narrowly escaped accident. In the other case, it was alleged that, though only travelling at ten miles an hour, the defendant's action in driving through passengers leaving a car was dangerous. The prosecuting solicitor added it had been decided that tramcar drivers and conductors should report every motorist who offended in this way. Fines of £5 and £3 respectively were imposed, and the Stipendiary (Lord Ilkeston) said he was glad to know steps were being taken to put an end to a very dangerous practice.

BOURNEMOUTH.

DISPUTE WITH POOLE SETTLED.

The dispute between Poole and Bournemouth Corporations over the recent increase of tramway fares by Bournemouth Corporation has been settled, and the opposition of the Poole Council has been withdrawn.

BRIGHTON.

PENNY FARES ABOLISHED.

The Town Council have abandoned the experimental penny fares and reverted to the twopenny minimum in view of falling traffic. The Tramways Committee have appointed a sub-committee to consider and report upon the reduction of staff of the undertaking, the quantity and value of stock in hand, and such other questions as may arise in the course of this investigation.

GATESHEAD.

TRAMWAY PURCHASE NOT RECOMMENDED—DRIVER'S PRESENCE OF MIND.

The Corporation have decided not to exercise their option—which fell due on August 12—of purchasing the system of the Gateshead and District Tramways Company. The cost of acquisition was estimated at about £500,000, with some £24,000 per annum as interest on the required loan. It was felt that the amount was prohibitive.—At the inquest on Richard J. Minto, aged 59, an inspector for twenty years in the employ of Gateshead and District Tramways Company, who died as the result of shock caused by witnessing a tramcar accident, the jury returned a verdict to this effect. The accident was caused by a motor coach colliding with a car ascending the gradient in West Street. The car was disabled and commenced to run backwards until it was stopped by a car in the rear. The coroner complimented the driver of the second car (Mr. A. D. Smith), who promptly applied his brakes and caused his vehicle to act as a buffer between the runaway car and the traffic in the rear. Mr. W. Morrison (general manager of the company) mentioned that the directors intended to reward Mr. Smith.

GLASGOW.

BORROWING POWERS—EXTENSION OPENED—THE PAISLEY PROPOSAL—HALFPENNY FARES—CELLULOID TOKENS.

The Tramways Committee have recommended the Town Council to increase the borrowing powers of the department to the extent of £600,000 in order to meet expenditure in connection with tramway extensions, motor omnibuses, the construction of Oswald Street bridge, and other matters.—The greater part of the Corporation Tramways extension from Netherlee terminus to Clarkston was opened for traffic on August 16. The whole extension will be a little over a mile in length, about three-quarters having so far been completed. On the previous day the Corporation Tramways Committee, headed by the convener (Bailie M'Whirr), representatives of the Renfrewshire County Council, the Cathcart Ward Committee, and others, proceeded by special car from George Square to the new terminus, whence they inspected the remaining incomplete portion of the route on foot. The remaining portion of the Clarkston extension is being rapidly completed, and the entire line is likely to be in operation about the end of this month. The construction of the new Provanmill route to the north-east of the city is also well in hand.—The Corporation, who are contemplating the acquisition of the system of the Paisley District Tramways Company, are seeking the views of the burghs concerned—Paisley, Barrhead, Johnstone, and Renfrew. Paisley Corporation, it is stated, are favourable to the scheme.—A motion to reinstitute a halfpenny fare for each single stage on the Corporation Tramways was carried at a meeting of the Sub-committee on Finance of the Tramways Committee on August 24. The parent committee, however, subsequently decided not to alter the fares at present.—Notices have been displayed in the tramcars to the effect that a good supply of celluloid tokens, which, like the paper coupons, entitle the passengers to a penny fare for three farthings, has been received from the makers. As the cost and handling of the paper coupons entails an extra outlay of £20,000 per annum, the public are advised to use celluloid tokens in preference to paper coupons.

HUDDERSFIELD.

PROPOSED TRAMWAY EXTENSION.

A start has been made with the extension of the Huddersfield Corporation Tramways to Brighouse, a length of single track having been laid in Crowtrees Lane, Rastrick. When completed, the extension will begin at the Smithy, Ash Brow, and proceed *via* Bradford Road to the New Inn, thence by way of the fields to Bradley Lane and Clough Lane to Rastrick. The route will then continue *via* New Hey Road, Crowtrees Lane, Ogden Lane, Gooder Lane to Huddersfield Road, and the terminus near the George Hotel, Brighouse. Here it will also form a link with the terminus of the Halifax Corporation system.

HULL.

TRAMWAY MANAGER'S SALARY.

The City Council decided, on August 4, to rescind the resolution which it passed a month previously to grant an increase in salary of £100 to the tramways manager. Mr. A. Stark moved the resolution to cancel the increase, and though the Council's earlier action was defended by the chairman of the Tramways Committee (Mr. A. D. Willoughby) and others, the resolution of negation was passed by 21 votes to 17. Mr. Stark argued that there were no grounds for any increase, and that the present salary was adequate, especially in view of the fact that the "rank and file" were having their wages reduced. Mr. McLeod defended the increase granted by the Council, and said when the manager came to Hull at a salary of £800 he was distinctly told it was a commencing salary, and if he justified himself it would be increased to £1,000. In the tramways they had the only undertaking in the Corporation which was making a profit. Mr. Willoughby said Mr. Rayner had got them out of a tight corner. The Labour members were fighting the manager because the committee told him to cut out waste and make the system pay.

IPSWICH.

WORKS COMMITTEE FORMED.

The electric supply and tramway departments of the Corporation have set up a Works Committee, and Mr. F. Ayton was elected chairman until he relinquishes the position of engineer and general manager of the electric supply and tramways departments. As

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previously announced, Mr. Ayton has accepted a position with Ransomes, Sims and Jefferies, Limited. It is hoped that the new committee will be instrumental in maintaining good relations between the Corporation and their employees.

KEIGHLEY.

Reconstruction of Railless Cars.

The trolley omnibuses of the Corporation were, as originally built, provided with a drive from the back axle. The cars have now been reconstructed and the motors have been placed on the front wheels. The Keighley system was one of the earliest railless routes in this country, and was constructed on an Austrian system with overrunning trolleys. All other railless lines in this country have underrunning trolleys.

LIVERPOOL.

Tramway Employees' Wages—New Route Indicator.

The following resolution was carried at a meeting of the Corporation tramway employees on August 10—"That this mass meeting of Liverpool tramwaymen strongly protests against the action of the Tramways Committee and City Council in forcing upon them reductions of wages without consulting the men or their representatives, and calls upon the Tramway Committee to give the reductions further consideration before such reductions are put into force." A new and ingenious tramway indicator is being installed by the Corporation Tramways at suitable points in the city. It consists of a map of the routes, each bearing a number, and a revolving dial. The prospective passenger first ascertains from the map the route he should take, and then, by turning a handle until the dial reveals the corresponding number, he is supplied with full information concerning the services on this line.

LANCASTER.

Town Council and Tramways Rights.

The Town Council have appointed a sub-committee to negotiate, together with Morecambe Town Council, for the purchase of the rights of the Lancaster and District Tramways Company on the Morecambe-Lancaster road.

LLANDUDNO.

Proposed Railless Trolley Cars.

The Town Council have decided to consider the advisability of inaugurating a service of railless trolley cars for the drive round Great Orme's Head. The route, commencing from and returning to Prince Edward Square, is about six miles in length.

LONDON.

Tramway Council and Unified Control—Coroner and London County Council Rule.

A meeting of the Metropolitan Municipal Tramway Council has considered the report of the special committee of, and adopted by the London County Council concerning the desirability of the Government introducing a Bill for the unified operation of local passenger transport undertakings in Greater London (as recorded in our issue of May 19). The Tramways Council have forwarded a communication to each of the municipal tramways undertakings in the extra metropolitan area, embodying the recommendations of the London County Council, and recommending the adoption by these undertakings of the following resolution—"That the Council of ———— strongly urges on the Minister of Transport the desirability of including representatives from the Extra Metropolitan Highways and Tramways Authorities in all conferences, or other bodies that may be set up as a preliminary to the introduction of legislation for the creation of a Traffic Control Authority for Greater London." At an inquest on the body of a man who was killed by an L.C.C. tramcar on the Thames Embankment, the coroner criticised the Council's rule forbidding drivers to make any statement to the police respecting fatalities before consulting the L.C.C. solicitor. He said it was an absurd rule, and he hoped it would soon be withdrawn. The driver of the car was exonerated from blame.

MIDDLESEX.

County Council Tramway Reconstruction.

The reconstruction of the track of the County Council Tramways along the Edgware Road from Cricklewood to Edgware has commenced, after prolonged negotiations between Hendon and District Council and the County Council. The cost of the whole work is estimated at £184,000, of which Hendon is to furnish £86,000. The cost works out at £84,000 per mile.

NEWCASTLE-ON-TYNE.

Track Improvements.

A rearrangement of the track of the Corporation Tramways between Bell's Close and Lemington is being carried out to obviate the necessity for cars proceeding over the two railway bridges which at present make this route an awkward one. The track is being diverted to the extent of nearly half a mile by the laying of new lines to the south of the present ones.

NORTH SHIELDS.

Fatal Tramway Accident.

The inquest on the five victims of the accident to a tramcar of the Tynemouth Electric Traction Company when going down Borough Bank, North Shields, on July 31, was concluded on August 16. The car was running down the hill, which is very steep and dangerous and leads to the River Tyne, when it got out of control. Though provided with emergency brakes, it gathered speed and approached the foot of the hill at a wild pace. The car failed to take the curve, toppled over, and was flung 25 yards, until it became wedged between two buildings and blocked the approach to the lower quay and the ferry landing. Over thirty people were injured, besides those who lost their lives. The coroner remarked that the jury had seen the damaged car, and found the brakes in proper order except for ordinary wear and tear. So far as he could see there was nothing to suggest that the car was not in proper order. He commented on the tests for drivers and conductors, and said they must consider whether the practical instruction was sufficient. There was also the question of advisability of medical tests for motormen. The jury returned a verdict of accidental death, adding that they were not prepared definitely to attribute blame to either the driver or the mechanism for the car running away. They were of opinion that the greasy condition of the rails defeated the efforts of both the driver and the brakes. No blame attached to the driver or to the conductor. The jury recommended that greater care should be taken in the selection of men for posts on cars which traverse banks. The question of additional mechanical contrivances should also be considered. Inspector Hall, of the Ministry of Transport, conducted an inquiry at Tynemouth on August 4. Thomas Hill, driver of the car, said—"On Sunday evening I stopped at the first compulsory stop, and I remember starting away by just using the hand brake. I did not stop at the second compulsory stop because the wheel picked up. I then applied the hand brake and released it to allow the wheels to revolve. Before starting away from the first stop in Saville Street I had partially applied the slipper brake, which was contrary to my practice." He used extra precaution because the wheels were greasy. He applied the brakes tighter and dropped sand, also taking other precautions, and thought he would be able to hold the car. It gathered speed, however, and was going very fast when it struck the curve. The Chief Inspector had several times gone down the Bank with him, instructing him. The conductor, aged 19, said he never touched the brakes at all going down hill. Evidence was given that the car was in excellent condition when it left the shed. The decision of the inquiry will be announced later.

PAISLEY.

Tramway Employees' Wages—Track Reconstruction.

The Paisley District Tramways Company and the Scottish Horse and Motormen's Union have agreed to a reduction in the rates of wages of the company's employees who belong to the union. Those in receipt of the maximum war bonus of 40s. were subject to a reduction of 1s. per week as from the first pay day in September. Another 1s. will be taken off in October, and a third 1s. in November. The wages of other grades will be reduced in proportion. Mr. Fred Coutts (general manager and engineer) states that these reductions are being brought about because of reduced tramway receipts, but in December the question of the men's wages will again be considered. Improvements and repairs estimated to cost £40,000 are being carried out on the track of the tramways company. At Paisley Cross the curve is being relaid with a larger radius, to facilitate the movement of traffic. Repairs to the permanent way are also being carried out at Potterhill and on the Glasgow Road route, which is operated by Glasgow Corporation Tramways. [A reference to the proposed sale of the Paisley undertaking appears under the Glasgow heading.]

POTTERIES.

Reduced Tramway Fares.

The Potteries Electric Traction Company have reduced 2d. fares to 1½d. and 3d. fares to 2½d., while the weekly tickets issued to workpeople have been reduced proportionately. The company have commenced a new through omnibus service between Stoke and Burslem. The omnibus fare from Hanley to Burslem has been increased from 1d. to 1½d., and is now the same as the tramcar fare. Motor coaches have for some time competed with the company's vehicles.

WALTHAMSTOW.

Proposed Railless Cars.

The Urban District Council have decided to seek Parliamentary powers to enable them to run a service of railless trolley cars.

WOLVERHAMPTON.

Conversion to Trolley System.

The Corporation Tramways, which have been worked on the Lorain surface-contact system since their construction in 1902, are being converted to the trolley system. Twelve miles of route, or more than half of the length, is now being worked on the latter system.

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PERSONAL.

Mr. J. G. Kent has been appointed a director of Walter Scott, Limited.

Sir Phillip Dawson was on September 13 elected a Member of Parliament for West Lewisham Division.

Mr. B. T. Hawkins, the new engineer of the electricity department of Wallasey Corporation, took up his duties on September 1.

Mr. A. S. Black, the recently appointed chief engineer and manager of Ipswich Corporation electric supply and tramways, took up his new duties on September 14.

The Mayor of Portsmouth (Councillor J. Timpson), who recently underwent an operation, has made such good progress that he has been able to resume his full duties.

Sir George Beharrel, financial director of the Ministry of Transport, is to act as secretary to the committee appointed by the Prime Minister to investigate the national expenditure.

Alderman W. H. Barrett has been elected chairman of the Salford Tramways Committee in succession to the late Alderman H. Linsley. **Councillor H. Hind** has been elected deputy chairman.

Mr. T. H. Ormsby has been appointed Professor in Municipal Engineering in the Faculty of Engineering in the University of London; **Mr. B. H. Knight** assistant in Municipal Engineering; and **Mr. H. T. Davidge** senior lecturer in Mechanical and Electrical Engineering.

Mr. Thomas Smalley, traffic superintendent of the Musselburgh and District Electric Light and Traction Company, Limited, has been appointed manager of the Leigh (Lancs.) Corporation motor omnibus undertaking and central works department, and has now taken up his duties.

Mr. A. F. Ayton, late chief engineer and manager of the Ipswich Corporation electric supply and tramways, has taken up his new position as managiug director of Messrs. Ransomes, Sims and Jefferies, Limited, on September 14. All communications should be addressed to him at Orwell Works, Ipswich.

Mr. F. N. Rendell Baker, power station superintendent at St. Helens Corporation Electricity Works, has been appointed acting electrical engineer for a period of twelve months, at a salary of £650 per annum. **Mr. B. T. Hawkins** has resigned on being appointed borough electrical engineer to the Wallasey Corporation Electricity Works.

Mr. C. Owen Silvers, general manager and engineer of Wolverhampton Corporation Tramways, was married on September 5 to Miss Nancy Doris Richards, M.A. (Oxon.), the daughter of Alderman C. T. Richards, of Wolverhampton. The marriage took place at the King's Weigh House, Duke Street, London, W., the Rev. W. E. Orchard, D.D., officiating.

Mr. E. A. Gatehouse, son of the late Mr. T. E. Gatehouse, has retired from his position as assistant manager of the contract department of the British Thomson-Houston Company in order to join the editorial staff of the *Electrical Review*. Mr. Gatehouse was entertained at dinner by the British Thomson-Houston staff, and presented with some handsome Georgian silver plate.

Mr. J. B. Hamilton, general manager of Leeds Corporation Tramways, has arranged to take a well-earned rest and with Mrs. Hamilton will make a tour of the world. They will sail for Shanghai on October 28, making various stops on the way. Some time will be spent in Shanghai, where a daughter of Mr. and Mrs. Hamilton resides, and the tour will then be continued to other Eastern points, the return journey being made through Canada and the United States.

Mr. C. W. Mallins, who retired about a year ago from the managership of the Liverpool Corporation Tramways and Omnibuses, has accepted a seat on the board of the Samuelson Transport Company, Limited. Mr. Mallins has had forty-five years of tramway experience, and his ample knowledge of traffic management will undoubtedly be of great value to the company. **Mr. J. C. Bliss,** of Manchester, has also accepted a seat on the board of the Samuelson Transport Company.

Mr. G. J. Churchward, O.B.E., chief mechanical engineer of the Great Western Railway, according to *Modern Transport*, is shortly to retire. Mr. Churchward joined the Great Western Railway in 1876, and in 1881 he was appointed assistant manager of the carriage and wagon works at Swindon, and on the retirement of Mr. James Holden became manager of the carriage works. In May, 1902, he succeeded Mr. William Dean as chief mechanical engineer of the company.

Mr. Arthur Brown, city engineer of Nottingham, has resigned. He has been an officer of the Corporation for fifty-four years, and has held his present office for more than forty years. His services are to be retained in a consultative capacity. Mr. Brown was responsible for the construction of the Nottingham Corporation electric tramways and for the maintenance of the permanent way. Mr. Brown, who has been styled "the maker of modern Nottingham," was honoured with a presentation from his staff when he attained his official jubilee in 1917.

Mr. W. M. Milnes, chief assistant engineer of Coventry Corporation Tramways, who is leaving to become general manager of Wigan Corporation Tramways, was on August 25 presented with a silver fruit dish, rose bowl, and attaché case. Mr. H. A. Goodyer occupied the chair. Mr. T. R. Whitehead (general manager), in making the presentation, referred in eulogistic terms to the valuable assistance rendered by Mr. Milnes during his nine years' service. Expressions of appreciation were given by Messrs. H. Jackson, F. Brand, T. Patchton, C. Savage, and E. P. Brown, representatives of the various departments. Mr. Milnes fittingly replied, and a vote of thanks by Mr. J. J. Medlock to the chairman terminated the proceedings.

Mr. P. H. Roscoe, after eighteen years' service as assistant electrical engineer to the Portsmouth Corporation Tramways department, is taking up an appointment as assistant electrical engineer and manager to the Coventry Corporation Tramways Committee. At a representative gathering of Portsmouth tramway officials, over which the general manager, Mr. W. R. Spaven, presided, Mr. Roscoe was presented with a canteen of cutlery and a case of fish servers as an expression of goodwill from the administrative staff, together with the motormen nad conductors. In making the presentation, Mr. Spaven said that Mr. Roscoe was held in high esteem by every one who knew him, and he wished him success in his new appointment. The traffic superintendent, Mr. W. Munford, and other officials, expressed their regret in losing a colleague who had always taken a great interest in the sporting activities of the tramwaymen. An appreciative response from Mr. Roscoe brought the pleasant ceremony to an end.

CONTRACTS AND ORDERS.

Salford Tramways Committee have ordered two sample ventilated motors from the English Electric Company, Limited.

Manchester Tramways Committee have accepted the tender of J. Spencer, Limited, of Wednesbury, for the supply of steel tramway poles.

The Brush Electrical Engineering Company have received an order from Hastings Town Council for a 1,125-kw. "Brush-Ljungstrom" turbo-generator at £17,705.

J. W. Courfenay, Limited, of Amberley House, Norfolk Street, London, W.C.2, have been reappointed sole advertising contractors to Belfast Corporation Tramways.

Glasgow Tramways Committee have placed an order with R. W. Blackwell and Company, Limited, and with Fleming, Birkby and Goodall, Limited, for insulated bolts.

It is reported that **Clayton Wagons, Limited,** of Lincoln, have received an order for 250 four-wheel tipping wagons required for the Bombay Back Bay reclamation scheme.

The Wallsend Slipway and Engineering Company have a contract for an oil fuel installation and tanks to be erected at the Southwick works of Brighton Corporation. The amount of the contract is £6,255 17s. 6d.

Babcock and Wilcox, Limited, received an order for the installation of the boiler plant at the Newport "B" power house, Victoria (Aus.). The order included a steel frame boiler house, coal bunkers, air heaters, induced and draught fans, feed pumps, and the amount of the contract is £178,000.

The Metropolitan-Vickers Electrical Company have secured an order form Grimsby Corporation for high-tension switchgear at £1,386. Out of eight tenders ranging from £1,800 to £2,860, for high-tension switch gear, that of the same firm has been accepted by the Islington Borough Council.

The Westinghouse Electric International Company have announced that they have received from the Imperial Government of Japan an order for two electric freight locomotives to be used in Tokio and the vicinity. The machines weigh 62 tons, have a capacity of 1,000 H.P. each, and work on direct current at 1,500 volts.

Chilian Railway Electrification.—A Reuter's telegram states that the Chilian Government have decided to take up a loan of £2,700,000 for the purpose of electrifying 200 kilometers of railway between Santiago and Valparaiso. The contract for the electrification of the line has been awarded to the Westinghouse Electric and Manufacturing Company, of Pittsburg, Pennsylvania. It is estimated that the construction and installation will cost approximately $4,000,000.

Liverpool Tramways Reconstruction.—The Liverpool Tramways Committee have authorised the city engineer to proceed with tramway reconstruction work involving an expenditure of £50,000.

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PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Speed regulating devices for electric vehicles (20,595)—Associated Equipment Company, Limited, and D. E. Batty.
Traffic indicator for vehicles (20,544)—A. E. Barker.
Vehicle jack (20,546)—J. Farrington.
Speed gear control of motor vehicles (20,677)—J. L. Johnson and B. Lusted.
Speed changing mechanism for motor vehicles (20,702)—L. R. Perucho.
Direction indicator for vehicles (21,314)—J. Crimmins.
Tramway lines (21,565)—A. Fenwick.
Direction indicating devices (21,509)—T. E. K. Greenhalgh and J. P. Mitchell.
Motor vehicles (21,121)—W. R. Hunt.
Brake release spring mechanism for tramcars (20,992)—H. Leah.
Mud-guards, life-guards, and brake, clutch, and power mechanism for motors (21,015)—D. Roche.
Motor vehicles (21,146)—J. D. Siddeley.
Motor vehicle front life-guard (21,430)—C. A. Stone.
Signalling device for motor vehicles (22,004)—H. Baker.
Direction indicating apparatus for motor vehicles (21,984)—A. Blacktop and R. Pollitt.
Rubber tyres for wheels of motor vehicles (21,592)—J. Briggs.
Means for connecting electric conductors to rails (21,742)—British Power Railway Signal Company, Limited, and H. E. Cox.
Connecting rod for reversing seats in series in tramcars (21,702)—C. Buchan.
Direction indicator for road transport (21,905)—R. H. Burkitt.
Automatic trolley retrievers for electric tramcars (22,074)—Chilian Electric Tramway and Light Company, Limited, and A. Bowen.
Splash-guard for motor vehicles (21,577)—C. U. Danks.
Signalling appliances for motor vehicles (22,083)—V. Gilligan, A. McGowan, G. Malcolm, and F. Wolsey.
Change speed gears (21,768)—P. J. E. Gregoire
Variable speed gearing (22,138) W. L. Griffin.
Clamping device for welding rails (21,850)—W. L. Gross.
Safety signalling devices for motor vehicles (22,066)—H. Hawthorn and H. A. Huntley.
Means for indicating inclination of motor vehicles (21,637)—C. R. Long, H. R. Long, and R. Long.
Rail making machines (22,116)—W. Mould.
Trucks for tramway or railway vehicles (21,644)—Peckham Truck and Engineering Company, Limited, and S. Thomas.
Bodies of motor vehicles (21,793)—Vigurs, Son, and others.
Tramway rails (22,019)—E. W. Walsh.
Signalling service for road vehicles (22,440)—J. Ashworth.
Variable speed gears (22,199)—B. G. Bartlett.
Automatic signal for road transport (22,182)—R. H. Burkitt, A. Dunton, and A. J. Triance.
Motor vehicles (22,769)—E. R. Fisher.
Road and rail vehicles (22,483)—N. Howe.
Springing of frames and chassis of vehicles (22,426)—H. Howes.
Steering wheels of motor vehicles (22,579) A. D. Lloyd.
Shoe and slipper brakes for motor vehicles (22,428)—J. A. Mason.
Change speed gearing for motor vehicles (22,554)—J. Rhodes.

SPECIFICATIONS PUBLISHED

1917.

Construction of built-up metal wheels for motor vehicles (7,379—*166,164*)—W. Challiner.

1919.

Brake controlled transmission gear of motor road vehicles (19,985—*165,847*)—E. J. de Normanville.
Variable speed gear (24,051—*165,865*)—Vickers, Ltd., and P. W. Gray.
Fluid pressure brakes (24,609—*135,170*)—Automatic Straight Air Brake Co.
Spring suspension of motor road vehicles (3,713—*166,205*)—L. E. Cowey.
Reversible variable speed gear (17,897—*166,233*)—J. C. Massier.
Strip feeding and punching mechanism for ticket punching apparatus (19,919—*166,242*)—B. M. Shanklin.
Driving axles of motor vehicles (22,941—*166,261*)—B. J. Michael.
Construction and arrangement of railway and road vehicles and draught coupling and buffing appliances (22,264—*166,593*).

1920.

Variable speed gears (410—*137,524*)—Zahnradfabrik Ges. and Count A. Von Soden-Fraunhofen.
Variable speed friction gearing (8,742—*165,921*)—G. Dearle.
Transmission and brake mechanism of power propelled vehicles (13,974—*166,017*)—F. W. Lanchester.
Direction indicators for road vehicles (14,087—*166,018*)—C. Thorpe.
Electric vehicles with storage batteries (17,556—*149,944*)—A. Couaillet.
Transmission mechanism for motor vehicles (18,689—*146,827*)—Entez Motor Patents Corporation.
Means for absorbing horizontal shocks in road and railway vehicles (4,425—*166,303*)—H. G. Wilson.
Convertible motor car bodies (10,403—*166,353*)—H. R. White.
Radiators for motor vehicles (11,966—*166,381*) E. G. Morley
Lifting jacks (12,413—*166,391*)—A. J. Neale and W. James.
Automobile vehicles (2,218—*166,600*)—J. V. Carden.
Anti-splash device for use on road vehicles (10,765—*166,683*)—J. Hudson and A. Baker.
Tyres for motor vehicles (11,015—*166,702*)—A. G. Canham.
Rail joints (11,067—*166,705*)—M. Alvarez.
Construction of hydraulic lifting or operating jack (11,508—*166,726*)—L. A. Collis.
Life-guard for tramway cars (11,788—*166,738*)—F. Hill.
Motor road vehicles (12,318—*166,752*) W. J. Young.
Controlling devices for motor vehicles (12,901—*166,758*)—R. Y. Bush.
Windows for tramway and railway vehicles (16,153—*166,798*)—A. Mollenkopf.
Wheel fenders or mud-guards for motor vehicles (16,706—*166,803*)—E. G. Budd.
Device for securing the springs of automobile vehicles (23,009—*166,827*) A. Citroen.
Trailer for automobile vehicles (16,206—*146,102*)—J. H. Labourdette.

1921.

Spring mountings for motor trucks (10,930—*166,092*)—W. F. Hudson.
Tip lorries (1,121—*157,245* and 1,119—*157,291*)—Soc. Anon. A. Saurer.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1920. WEEKS ENDED Aug. 7	Aug. 14	Aug. 21	Aug. 28		1921. WEEKS ENDED Aug. 6	Aug. 13	Aug. 20	Aug. 27		AGGREGATE. Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdeen Corporation	4,640	4,517	4,375	4,023	...	4,159	4,251	4,002	3,995	...	12½	47,299	– 5,709
Aberdeen Motor Buses	105	93	90	83	...	433	487	430	347	...	12½	5,124	+ 4,586
Ayr Corporation	1,198	1,375	1,026	1,072	...	1,184	1,336	1,115	953	...	15	14,485	– 773
Barrow Corporation	1,006	1,035	930	967	...	952	878	1,050	920	...	21	19,412	+ 464
Belfast City Tramways	...	...	11.853	11,591	...	...	...	12.496	12,059	...	21	269.886	+ 23.393
Birkenhead Corporation	3,191	3,000	2,948	3,010	...	2,655	2,581	2,806	2,746	...	21½	54,641	– 10.582
Birkenhead Motor 'Buses	701	588	569	554	...	950	999	793	685	...	21½	16,732	+ 7,289
Birmingham Corporation	31,227	32.084	33.171	33.419	...	26.318	27.317	28.870	28.853	...	21	621.736	– 12.426
Birmingham Motor 'Buses	2,509	2,059	2,096	2,074	...	2,204	1,825	2,022	1,903	...	21	45,991	+ 1,491
Blackburn Corporation	2,915	2,869	2,942	2,890	...	2,501	2,377	2,599	2,767	...	21½	49,520	– 7,399
Bradford Corporation	13.684	12.787	12.424	12,271	...	15.627	13.659	15.186	13.955	...	21	287.231	+ 16,453
Burnley Corporation	3,862	3,821	3,111	3,187	...	3,537	3,407	3,641	3,449	...	—	—	—
Burton-on-Trent Corporation ...	713	638	618	635	...	738	665	662	665	...	21	13,513	+ 865
Bury Corporation	2,792	2,768	2,815	2,876	...	2,472	2,483	2,673	2,614	...	21½	52,787	– 4,824
Chatham and District	2,360	2,115	2,048	1,955	...	2,038	1,827	1,769	1,758	...	34	56,297	– 1,965
Derby Corporation	2,774	2,496	2,399	2,367	...	2,471	2,234	2,276	2,256	...	21	46,068	– 3,192
Dundee City	2,701	2,621	2,729	3,248	...	2,925	3,157	3,149	3,235	...	14½	48,989	+ 8,044
East Ham Corporation	2,190	2,137	2,173	2,031	...	2,214	2,012	2,129	1,979	...	21½	45,326	+ 3,867
Edinburgh Corporation	14,766	13,859	12,859	12,016	...	13,297	12,551	12,616	11,503	...	15	207,935	– 6,838
Edinburgh Motor 'Buses	1,024	991	871	926	...	3,693	3,339	3,600	3,182	...	15	63,810	+ 52,341
Glasgow Corporation	42,916	43,434	44,276	38,903	...	44,215	43,087	45,426	43,304	...	12½	567,482	+ 37,519
Glossop (Urban Elec. Supply Co.)...	281	264	255	206	...	231	239	261	237	...	35	8,114	+ 221
Halifax Corporation	4,148	4,841	5,319	4,909	...	4,982	4,898	4,809	5,093	...	20½	91,069	+ 7,051
Halifax Motor 'Buses	105	132	131	116	...	62	60	51	63	...	20½	2,001	– 293
Halifax Railless Cars	...	...	...	...	...	57	78	74	59	...	5	333	—
Huddersfield Corporation	6.037	5.686	5.586	5.541	...	5.825	5.419	5.619	5.370	...	22	118.022	+ 14.984
Ilford U.D. Council	1,492	1,389	1,390	1,321	...	1,613	1,455	1,495	1,462	...	21½	33.162	+ 5,672
Ipswich Corporation	1,497	1,223	1,190	1,136	...	1,205	1,014	1,062	1,081	...	21	18,992	– 3,231
Isle of Thanet...	3,556	3,407	3,399	3,083	...	3,485	3,495	3,419	3,285	...	46½	50,983	– 1,494
Kilmarnock Corporation	331	357	252	382	...	361	339	369	373	...	14½	5,580	+ 60
Leicester Corporation	6.821	6.755	7.002	6.903	...	7,093	6.646	7,192	7.055	...	—	—	—
Liverpool Corporation	...	28.726	27,991	28.448	...	...	29,818	30.886	30.243	...	34½	978.300	+ 45,189
London County Council	89,661	87,634	91,433	86,980	...	104.074	97,150	98,793	99,510	...	21	2,109,615	+ 314,651
Maidstone Corporation	634	547	535	511	...	608	510	498	506	...	20	10.398	– 295
Manchester Corporation	36.917	35.447	35.963	36.543	...	37.398	36.548	39.244	38.230	...	21	845.530	+ 179.738
Newcastle-on-Tyne Corporation ...	11.393	10.932	10,918	11,173	...	12.178	11.317	11.396	11.333	...	21	242.503	+ 7,973
Nottingham Corporation	8,981	7,868	7,866	7,710	...	7,796	7,210	7,323	7,192	...	21	128.025	– 37,982
Oldham Corporation	5.272	5.097	5.239	4,713	...	4,837	4,945	5,163	5,136	...	23	109.037	+ 3.439
Reading Corporation	1,878	1,727	1,738	1,677	...	1,914	1,642	1,680	1,658	...	21	33.690	– 2.071
Reading Motor 'Buses	377	341	311	290	...	484	383	377	396	...	21	7,701	+ 2.118
Rotherham Corporation	2,987	3,121	2,849	2,863	...	2,602	2,529	2,497	2,564	...	20	43.671	– 9.909
St. Helens Corporation	2,879	2,397	2,362	2,292	...	2,213	1,898	1,927	1,993	...	21	39,030	– 4,424
Sheffield Corporation... ...	23,297	21,116	21,736	21,544	...	20,789	19.330	20.693	19.912	...	21½	422.531	– 28.616
Southampton Corporation	...	3,789	3,789	995	...	...	3,452	3,388	3,505	...	21	60.487	– 4,983
Southampton Motor 'Buses	...	148	124	66	...	...	92	91	92	...	21	4,540	– 189
Southend Corporation	...	...	...	3,742	...	...	...	...	4,408	...	22	57.543	– 1.168
South Shields Corporation	2,300	2,202	2,188	2,170	...	2,080	1,846	1,885	1,822	...	22	35,784	– 6,113
Sunderland Corporation	3,883	3,559	3,256	3,317	...	3,330	2,929	2,898	2,820	...	21	56,723	– 11,925
Swindon Corporation	...	...	464	416	...	...	...	437	447	...	20½	8,593	+ 285
Tyneside Tramways and Tramroads	1,717	1,529	1,560	1,404	...	1,376	1,137	1,123	1,104	...	8	9,441	– 1,393
Wallasey Corporation	3,783	3,064	2,901	2,892	...	3,600	3,030	3,279	2,981	...	21½	62,201	+ 3,632
Wallasey Motor 'Buses	300	241	213	214	...	298	289	254	275	...	21½	5,727	+ 1,487
Walsall Corporation	2,199	1,752	1,897	1,793	...	2,002	1,611	1,785	1,678	...	22	35,823	– 2,452
Walsall Motor 'Buses	1,898	1,228	1,357	1,291	...	1,582	1,019	1,125	1,038	...	22	20,529	– 2,973
Walthamstow U.D. Council	2,402	2,359	2,305	2,190	...	2,535	2,098	2,133	2,045	...	21½	48,251	+ 2,518
Warrington Corporation	1,117	997	979	1,000	...	1,059	1,003	982	978	...	21	20,467	– 363
West Ham Corporation	5,631	5,502	5,606	5,408	...	6,412	5,842	5,920	5,830	...	21	124,490	+ 8,929
Wolverhampton Corporation ...	2,431	2,647	2,412	2,509	...	2,309	2,581	2,471	2,381	...	22	51,467	– 2,900
Wolverhampton Motor 'Buses ...	451	454	452	461	...	674	704	698	682	...	22	14,432	+ 5,396

Underground Electric Railways Company of London, Limited.

NAME OF COMPANY.	1920. WEEKS ENDED Aug. 7	Aug. 14	Aug. 21	Aug. 28		1921. WEEKS ENDED Aug. 6	Aug. 13	Aug. 20	Aug. 27		AGGREGATE. Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Underground Rlys. & L.G.O. Co. ...	...	...	...	...	...	242,589	226,765	231,068	227,951	...	34	8,100,785	—
London and Suburban Traction ...	...	...	...	...	...	63,440	56,351	57,458	55,670	...	34	1,985,217	—

Colonial and Foreign Tramway Traffic Returns.

Companies Issuing Weekly Returns.

NAME OF COMPANY.	1920. WEEKS ENDED Aug. 7	Aug. 14	Aug. 21	Aug. 28		1921. WEEKS ENDED Aug. 6	Aug. 13	Aug. 20	Aug. 27		AGGREGATE. Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	76.114	79.233	76.245	76.949	...	78.025	80,254	80.101	81.383	...	34	2,692.723	+ 138.530
Calcutta ... ... Rs.	90,801	94,512	97,223	97,025	...	97,506	101,839	95,853	90,744	...	37	2,709,305	– 485,648
Madras... ... ... Rs.	...	(2 weeks)	51,568	...	...	...	(2 weeks)	47,984	...	...	—	—	—
Pernambuco	5,927	5,817	5,769	5,657	...	3,500	3,453	3,033	3,139	...	34½	127,865	– 113,368

Companies Issuing Monthly Statements only.

	1920. Mar.	April	May	June	July	Aug.	1921. Mar.	April	May	June	July	Aug.	Wks.	AGGREGATE. 1921.	+ or –.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	4,182	4,933	3,673	3,672	3,690	...	4,934	5,120	4,570	4,134	3,842	...	16	17,666	+ 1,698
Brazilian Trac. Mlrs	9900,000	1024500	1098500	10874000	11745000	...	13102000	13562000	14462000	14257000	15477000	...	30	95,676,000	+ 22891000
British Columbia $	761,182	749,081	720,004	710,210	788,402	...	816,452	791,688	774,523	750,907	840,155	...	5	840,155	+ 51,753
Buenos Ayres L'c'z.	55,000	53,429	54,563	50,635	51,508	53,952	59,365	60,238	58,492	51,071	51,944	55,673	8	107,817	+ 2,357
Burma	45,117	44,673	46,783	50,471	52,289	...	50,930	50,159	48,353	54,275	43,764	...	52	605,377	+ 53,421
Cape Town ...	...	...	24,395	...	...	...	...	27,662	27,407	25,038	25,571	...	—	—	—
Carthagena & H. ...	3,493	5,482	5,313	5,562	4,164	3,721	2,226	2,329	1,602	1,410	1,936	1,773	34	17,992	– 18,499
Cordoba	18,522	...	...	...	...	20,189	21,736	...	...	...	23,629	...	17	92,395	+ 12,640
East India ...	3,592	3,916	3,980	3,862	4,081	4,109	4,168	4,560	4,392	4,078	4,591	4,513	4	4,513	+ 404
Kalgoorlie	3,142	3,246	3,276	...	...	...	2,485	2,398	2,362	...	...	...	22	9,980	– 4,934
La Plata	6,392	6,142	...	...	5,353	...	3,404	5,878	...	...	5,425	...	30	33,317	– 5,180
Lima	...	...	...	...	...	...	...	...	...	...	...	...	8	124,329	+ 9,593
Manila ... $	263,690	254,103	261,803	267,169	282,260	...	298,317	279,535	293,873	310,559	305,126	...	31	2,115,267	+ 231,332
Monte Video ...	...	...	42,401	39,989	39,647	...	...	...	46,579	42,960	42,411	...	39	418,827	+ 31,892
Para	24,872	24,760	25,851	25,392	24,243	...	24,240	24,340	24,755	24,884	24,655	...	35	193,954	– 4,154
Port Elizabeth ...	...	...	6,165	...	...	...	...	7,082	6,304	6,180	6,515	...	—	—	—
Rangoon ... Rs.	130,470	117,860	119,000	117,735	118,667	...	158,121	125,163	138,950	130,000	133,536	...	30	929,076	+ 98,314
Toronto ... $	1255,668	1211,708	1206,930	1127,239	1189,315	...	1318,273	1259,933	1271,306	1295,701	1229,483	...	31	3,877,669	+ 642,606
Winnipeg ... $	456,915	431,685	404,742	407,625	391,709	...	495,208	462,378	433,836	432,894	390,109	...	31	3,180,779	+ 144,393

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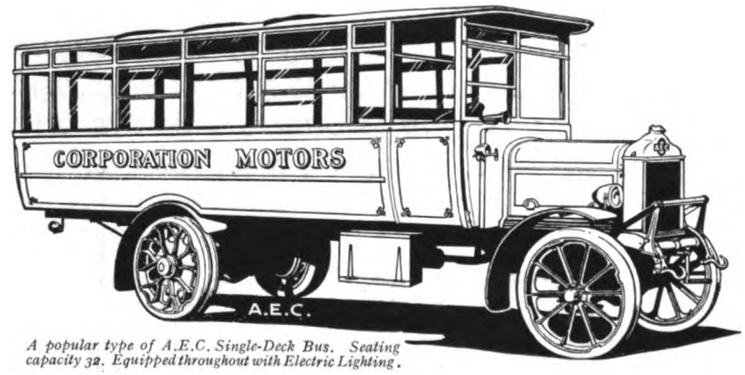

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OLYMPIA
October 14—22, 1921
STANDS 84 (Vehicles) 159 (Components)

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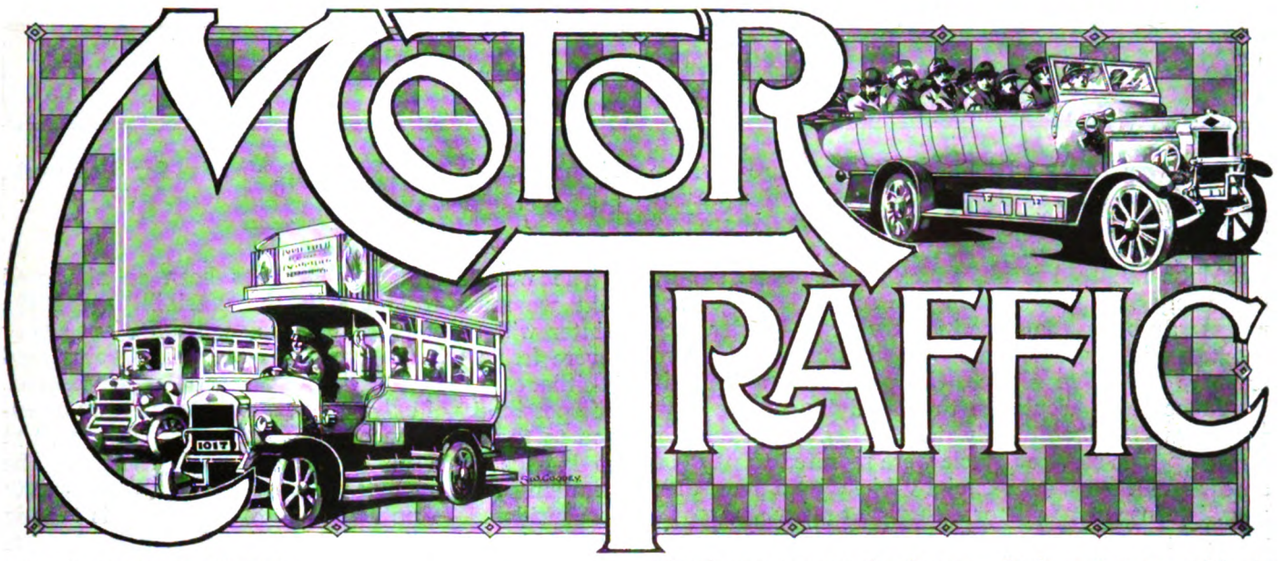

MOTOR COACH PROSPECTS.

The development of motor coach traffic during this summer season has been rapid and the success accompanying the development has been so exceptional that it can only be regarded as abnormal. Circumstances have combined together in an extraordinary manner to assist the motor coach to get a firm hold on public patronage. Not only have we experienced the mixed blessing of a long period during which one could safely prophesy fine weather for days ahead, but this unusual state of affairs has occurred just when, owing to the coal shortage, the railways were only able to offer very attenuated services. Thus, just at the time when people were compelled to use the roads if they wished to travel at all, the attractions of a road journey under good conditions were experienced to the full. People found how much more pleasant it was to travel through the open air, getting a reasonably uninterrupted view of the country. The journey, instead of being a necessary evil, became a positive pleasure, and could be regarded as a part of an enjoyable holiday instead of as an objectionable preliminary. From this point of view, the extra duration of the trip as compared with a good and direct railway service is no disadvantage. Under these conditions, many people formed a new travelling habit and, once formed, the railways may find it difficult to break them of it. The motor coach proprietor has not only obtained quick profits this year, but has built up goodwill for next, and has definitely entered into a new sphere of business quite outside his old limitation of circular trips beginning and ending at the same point.

Having been almost forced to take this step by the temporary failure of railway competition, he has, of course, discovered the necessity for dealing with passengers' luggage, and has so developed another decided advantage of his service as against the railway train. A holiday maker travelling, say, sixty or seventy miles, may only have to pay about ten shillings for his railway fare, but the cost of the journey is pushed up by terminal expenses—getting to and from the railway stations—which may increase his expenditure fifty or even a hundred per cent. If a well-organised motor coach service offers to collect and deliver his luggage, charging a reasonable inclusive fare for that work and for his own conveyance, he is saved a good deal of trouble; and the position is such that the charge per mile for the conveyance of the passenger may be higher than on the railway and yet the total cost of the journey may be lower. It is not reasonable to suppose that, in direct and unlimited competition, the motor coach can undercut the railway in respect of fares. Its permanent popularity must therefore be based on other causes. The elimination of trouble and expense at the terminals may be an important factor, and another is unquestionably the fact that open-air travel across country is more interesting than travel in a closed conveyance running largely in cuttings.

It is for this latter reason that it seems doubtful whether the attempts now being made to popularise the motor coach for winter travel will meet with any general measure of success. Our climate is such that the vehicles used for this purpose must necessarily be covered in. Thus the great attraction of the road is missing. Also, operating costs will be higher when the going is heavy, and altogether the competition with the railway will have to be more directly upon the basis of fares which, as already suggested, is not the direction in which the motor coach is inherently at an advantage. There will, of course, be opportunities in places where there is no direct rail communication, but, as a general proposition, the possibilities of big development do not seem to be particularly promising.

TAXATION BY WEIGHT.

Of the various principles embodied in the current scheme of motor taxation, that of taxation by weight, which is at present applied only to commercial vehicles, is undoubtedly the least objectionable. Taxation by horse power is intrinsically bad, because it encourages designers to cut down power to a minimum, with the result that it is inadequate if the travelling conditions are unfavourable or if the engine is not in very perfect tune. Particularly is the horse power basis objectionable because it encourages the production of vehicles of a type not in the least attractive in overseas markets. This involves either the neglect of those markets or the division of output so as to cater both for home and for foreign trade. The first alternative is thoroughly reactionary. The second is undesirable on the grounds of economy of production.

The basis of seating capacity at present applied to public service vehicles is also a faulty one and constitutes an unnecessary complication. Some vehicles may be used sometimes for the carriage of passengers and at other times for the carriage of goods. As matters stand, the tax on one particular vehicle may be increased if passengers are carried while that on

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MOTOR TRAFFIC

another vehicle may be higher if goods are carried. There are all sorts of debatable points in the present scheme, which may be good for the lawyers but are bad for everyone else. All these anomalies and obscurities would be removed if all vehicles were taxed simply and solely on a weight basis, the scale of charges not necessarily being the same in every case. Under such a scheme, if a vehicle were used alternatively for two or more classes of service, the payment to which it would be liable would be that applying to the class that is the more heavily taxed. If, for example, a 3-ton public service vehicle were required to pay £60 a year and a 3-ton commercial vehicle £20 a year, then a vehicle used at will for either of the two purposes would be liable to pay £60, and there could be no question as to the correct legal position. Another advantage of making weight the sole basis of taxation would be realised to the full if weight were also made the sole basis for the estimation of legal speed.

COMMERCIAL VEHICLES FOR OVERSEAS SERVICE.

A number of overseas motor traders temporarily visiting this country have recently, at the desire of certain British manufacturers, met and jointly compiled the outline of a specification which in their opinion represents the essentials of a car likely to be generally useful and acceptable in the overseas markets. The specification is not that of a commercial vehicle, but in certain respects the requirements must necessarily be similar. In this connection, an interesting point is that the ground clearance asked for is no more than nine inches. One has often heard isolated demands for a clearance of 10½ in. or even 12, so it is satisfactory to note that cases in which such high clearance is necessary are the exception rather than the rule, or, in other words, that from this standpoint most existing British vehicles are satisfactory for overseas use. The position is not so good as regards wheel track. Great emphasis is laid on the importance of standardising this dimension so as to make the machines as serviceable as possible wherever roads consist merely of two narrow ruts worn by the wheels of the animal-drawn vehicles in regular use. Practically everywhere the wheel track required is from 4 ft. 8 in. to 4 ft. 9 in.

In respect of private cars, the demand is for ample engine power with comparatively light chassis weight and with a moderately low top gear, enabling most hills to be negotiated without changing down. This general idea is not always consistent with the best possible fuel economy, and should therefore be modified to some extent in the case of a commercial vehicle, in respect of which economy of operation is of the highest possible importance. A somewhat obvious point is, of course, that big radiator capacity is wanted, and it is suggested that a variable fan speed should be provided for, so that the degree of cooling can be varied at different times of the year. In the mechanism generally, unit construction is advocated and there is proper insistence on the importance of great strength in the gears and subsequent transmission. The only note which seems to give any idea as to how economies in first cost could be effected is that which points out the desirability of eliminating brass fittings and providing accessories which, while effective for their work, are quite roughly finished.

ANTICIPATING WINTER CONDITIONS.

The weather this summer has been so abnormal that we must reckon with the possibility that the winter will be equally so. We may experience very severe frosts or a long period of excessive rains, and in either case the motor vehicle owner must be prepared. The possibility of extremely cold weather draws attention to the importance of so housing the vehicles that no damage will result from severe frosts at night. The question of artificially heating the garage may have to be considered. Another point to remember is that in very cold weather the engine cooling system, if adequate in the summer, becomes over-effective. The result is a falling off of fuel economy. If the radiator has been found to be addicted to boiling in the hot weather, a cold spell will merely rectify that effect. If it has kept the water reasonably cool during hard work in the hottest season, it may be worth while to apply some device by means of which a part of the surface can be put out of action during the winter. This is quite a simple and inexpensive matter.

Should the weather prove very wet, the roads will inevitably be heavy and, whatever we may do to prevent it, petrol consumption will increase. This cannot be balanced by carburettor adjustments tending to weaken the mixture, because at the same time such adjustments will tend to reduce the available engine power, and so will lead to slow running owing to the necessity for frequently changing gear on hills. All that one can do is to see that the engine and the mechanism generally are in thoroughly good condition before the stiffest work of the year begins.

COMMERCIAL VEHICLE EXHIBITION.

TO BE HELD AT OLYMPIA IN OCTOBER.

The fifth International Commercial Motor Exhibition will be opened at Olympia on October 14, and will continue until October 22. The organisation is being carried out by an exhibition committee under the chairmanship of Mr. F. Churchill, chairman of the Commercial Vehicle (Petrol) committee of the Society of Motor Manufacturers and Traders, and practically the whole of the space has been allotted. The exhibits will comprise petrol, steam, and electric vehicles for goods and passenger transport and general utility purposes. Many new and interesting developments in commercial motor traction will be shown.

The Institute of Transport is organising two conferences at Olympia in connection with the exhibition on Monday, October 17. In the morning a paper will be read on "Roads," and in the afternoon on "Commercial Vehicles."

The Institution of Automobile Engineers is arranging the following conferences—Wednesday, October 19, 11 a.m., a paper on "The Scope of Farm Tractors," by Mr. E. H. Arnott, and at 2.30 p.m., a paper on "Agricultural Tractors," by Mr. H. D. Burford, chairman of the agricultural and machinery section of the society, and Mr. H. Scott Hall; Thursday, October 20, 11 a.m., a paper on "Coke as a Fuel for Commercial Vehicles," by Mr. T. Clarkson, and at 2.30 p.m., a paper on "Loading Devices for Commercial Vehicles," by Mr. W. D. Williamson.

COMMERCIAL MOTOR USERS' CONFERENCE.—The fourth provincial conference of the National Council of the Commercial Motor Users' Association will be held at Bristol on October 5 and 6. Sir H. Maybury, director-general of the Roads Department of the Ministry of Transport, has promised to attend.

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MOTOR TRAFFIC

MOTOR COACH AND OMNIBUS REGULATIONS.

NEW RESTRICTIONS TO BE EXPECTED SHORTLY.

As announced in our issue of August 27, new regulations for passenger-carrying vehicles may shortly be expected. While the varying conditions which obtain in different parts of the country make it extremely difficult and, indeed, inadvisable, to frame anything like standard regulations as to details, an effort is being made to draft general principles which will form a guide for each of the licensing authorities.

The great increase in public motor services and the exceptional patronage they have received has taxed to the utmost the resources of regular motor coach proprietors, and, moreover, the abnormal demand for seats in this type of vehicle has induced a number of motor vehicle proprietors, many of them entirely new to passenger transportation, to fit up a variety of vehicles of the more or less freak order, with a view to obtaining the greatest possible advantage of the exceptional circumstances. Some of these vehicles do not conform to recent practice, and in view of the congested state of the most popular routes the element of danger, always present in a greater or less degree, is considerably increased. Under these circumstances the need for more stringent regulations with regard to constructional features is unquestionable. As the safety of the travelling public must be regarded as a first charge upon licensing authorities, we may confidently expect that the experience of the past few months will enable them to draft regulations which will ensure the maximum of safety and comfort for the public, and at the same time meet with the approval of the manufacturer. With regard to the London area it has been generally known that the Commissioner of the Metropolitan Police, who is the licensing authority, has the matter well in hand, while a committee appointed by the Ministry of Transport are considering the question from the point of view of the general public.

In the meantime there is naturally considerable anxiety both among manufacturers and the general users of the road to know what is to be the outcome of these deliberations. From special inquiries we understand that definite regulations may shortly be expected. While it is as yet impossible to state the exact nature of these, in view of the fact that the report of the committee has not yet been presented, it may be regarded as certain that among the requirements of the new regulations the following will be included—

No passenger-carrying vehicle will be permitted to exceed 25 ft. over all, while the wheel base, except in the case of specially designed chassis, which are to be considered upon their merits, is not to exceed 16 ft.

The over-all width, including hood fitments, door handles, etc., will be limited to 7 ft. 6 in.

Petrol tanks will no longer be allowed to be placed under the driver's seat as is the present practice, but must be placed at the rear of the vehicle.

All vehicles will be required to carry chemical fire extinguishers placed in an easily accessible position.

All doors must open readily and to their full width.

A CONCESSION TO MAKERS AND USERS.

Manufacturers have for some time complained that the regulations governing the issue of licences have caused many would-be purchasers of vehicles to wait for quarter day before making their purchase, in order to obtain the benefit of the full period of the licence they may wish to take out. This hindrance is abolished by a clause of the recently passed Finance Act. On and after January, 1922, the clause confers upon the Minister of Transport power to issue licences in respect of mechanically-propelled vehicles (other than tramcars or vehicles on which a duty of 5s. is chargeable under that Act) for such periods of the year and on payment of duty at such rates as may be prescribed by order. The duty must not be less than the proportion which the period bears to the year, nor, in the case of quarterly licences, more than 30 per cent. of the full duty, except that in the case of licences for motor cycles taken out on or after October 1 it may not exceed one-half the full annual duty. This concession allows anyone to register and procure a licence for any motor vehicle at any period of the year in place of either taking out an annual or quarterly licence as at present.

FUEL QUESTIONS.

REDUCTION IN THE PRICE OF PETROL.

On August 18 the wholesale price of petrol was reduced by 5d. per gallon for all grades, and in accordance with the sliding scale of retailers' profits the price to motorists fell by 6d. per gallon, as appended—

Aviation spirit	2s. 9½d.	per gallon
First quality	2s. 5½d.	,,
Third quality	2s. 3½d.	,,

The reduction is due to the accumulation of stocks in this country threatening a storage difficulty, while in the United States and other producing countries the increased output has been so great that the American motorist is paying on the average only 1s. per gallon. There are also falls in the prices of lubricating oils and of tyres. On August 19 heavy oil fuel had dropped from 90s. per ton to 75s. per ton, ex wharf. For bunkers, the price of Diesel oil declined to 105s. per ton.

Owners of coaches have estimated that the reduced price of petrol will effect a saving of about a penny per mile, the consumption averaging from six to eight miles a gallon. Omnibus undertakings and commercial vehicles may be able to effect a welcome reduction in running costs, but the former are not likely to be able to reduce fares until there has been a cut in the wages of their employees.

In the case of the London General Omnibus Company the vehicles consume nearly 50,000 gallons of petrol a day, apart from benzol, and the lower charge for petrol will result in a saving of nearly £1,200 a day. It has been stated in some quarters that the cut in petrol may result in the return of the penny fare, but we understand that there is no possibility of fares being reduced until the company can come to an arrangement with the employees for an extension of spread-over time, in order to enable vehicles to be taken off during the slack period of the day.

SCARCITY OF BENZOL.

During the past year there has been a general complaint of the poor quality of petrol, and this has led to an increased demand for benzol for the purpose of mixing with petrol. The supply of benzol seems to be decreasing. The end of the war brought with it a great decrease in the production of benzol, and the three months' cessation of coal mining led to another fall in production of the spirit, owing to the inaction of blast furnaces and the ovens possessed by collieries. There is not likely to be any increase in the supply until trade revival brings the coke ovens generally into operation.

ENCOURAGEMENT FOR HOME PRODUCED ALCOHOL.

Under the recently passed Finance Act, the Government have increased the allowance of threepence per proof gallon on British distilled power alcohol to fivepence. The same clause removed the net surcharge of twopence per proof gallon from power alcohol imported from any part of the Empire. Consequently power alcohol produced within the Empire is not only free from duty, but has a preference of about two shillings a gallon over foreign spirit. At present the cost of production is a hindrance to developments in the use of alcohol as fuel, but experts state that this difficulty is being overcome, and, further, they contend that it is now possible to sell power alcohol at two shillings per gallon. In South Africa an alcohol mixture derived from the otherwise useless prickly pear is produced at a cost 50 per cent. below that of petrol. It is suggested that by using the waste products of sugar refining in the West Indies for alcohol production, the refiners could hold their own against European sugar beet production.

PETROL FROM VEGETABLE OILS.

In a paper recently read before the French Academy of Science M. Mailhe claimed to have found a means of manufacturing motor spirit from linseed and other vegetable oils. His method consists in passing the vegetable oil over special apparatus formed of parts called catalysers, which deprive the oil of its water and hydrogen. The volatile product thus obtained is then passed over nickel, which gives to the vegetable oil the aromatic hydrocarbons which render it in all respects similar to petrol.

ROBBERIES FROM U.S.A. ROAD SERVICES.—Hand grenades are being carried, in addition to rifles and pistols, by drivers of intercity trucks carrying merchandise out of Philadelphia. Upward of three-quarters of a million dollars has been stolen in merchandise along the Lincoln highway in six weeks from trucks operating over it. Each truck convoy has a "convoy master."

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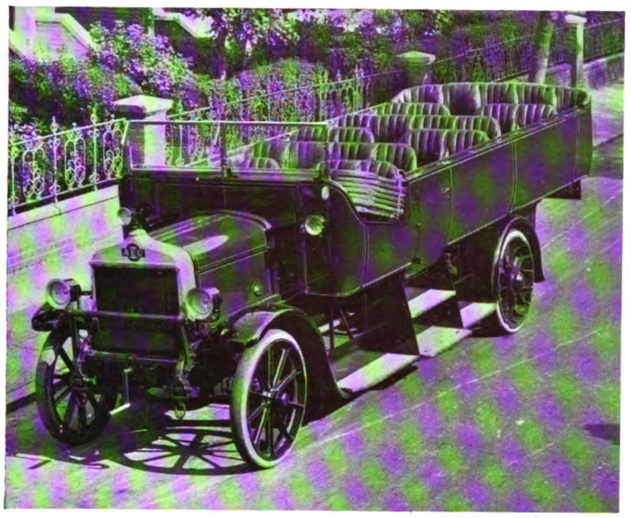
MOTOR TRAFFIC

L.G.O.C.'s NEW MOTOR COACH.

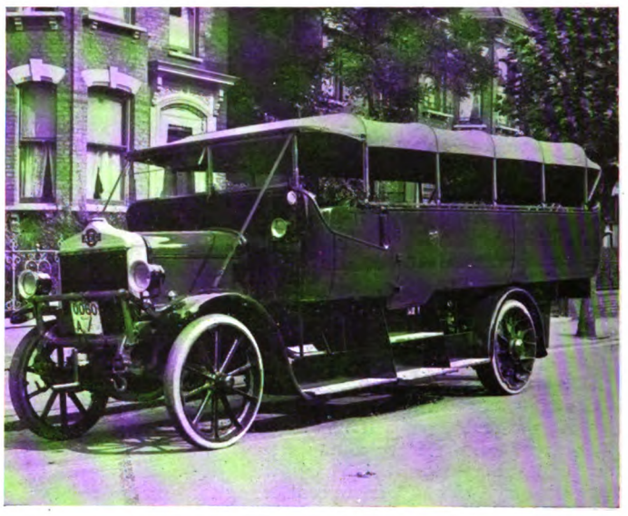
HOOD CARRIED ON FRONT OF BODY.

A motor coach possessing several new and interesting features has been turned out recently from the factory of the London General Omnibus Company at North Road, Holloway. The body is carried on the standard 3-ton chassis of the Associated Equipment Company, and as will be seen from the accompanying photographs, one of the principal departures is that the hood, when folded, is accommodated on the front instead of at the rear of the body. This arrangement is regarded as possessing many advantages, including decrease of rear overhang by about two feet; the absence of damage to the hood when the vehicle is being reversed; and a decreased tendency to skid, owing to the weight of the hood being carried forward. There is also no possibility of back doors flying open through the weight of the hood whipping the rear of the body (though incidentally there is but one forward door to this particular coach). By carrying the hood on the top side rail of the body, and thus obviating projections, no damage is likely to occur through "side" collision. With standard fittings this would do extensive damage. When the hood is down, the driver has a better vision to the rear, whilst reversing. The front position also renders it possible to stow away the hood neatly with a more rigid fixing. There is no possibility of damage through cyclists and others hanging on as is the case with a hood fixed at the rear, or by passengers sitting on it, or using it for storing heavy luggage. The front hood also affords a much better appearance, giving the coach the effect of being hoodless. Further, a reduction of the weight of the body is effected by cutting out the supporting ironwork at the rear, which is necessary when the hood is carried at the back.

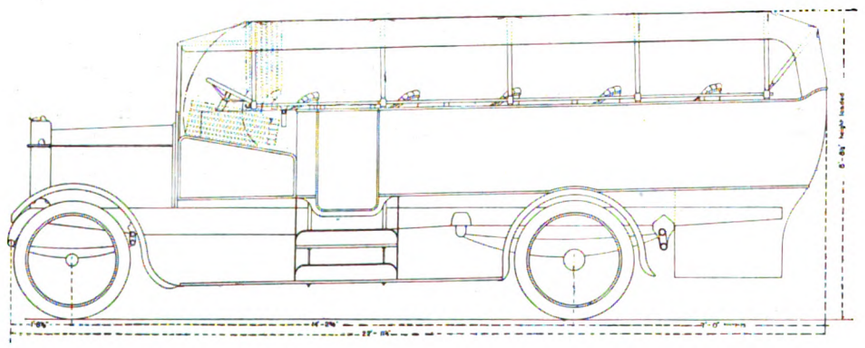
The coach has a single door, just to the rear of the front seat, and it is pointed out that the absence of other doors gives added strength to the body. There is seating capacity for 23 passengers excluding the driver, and the fact that a few seats have been sacrificed as

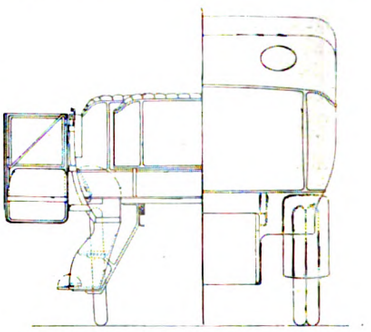


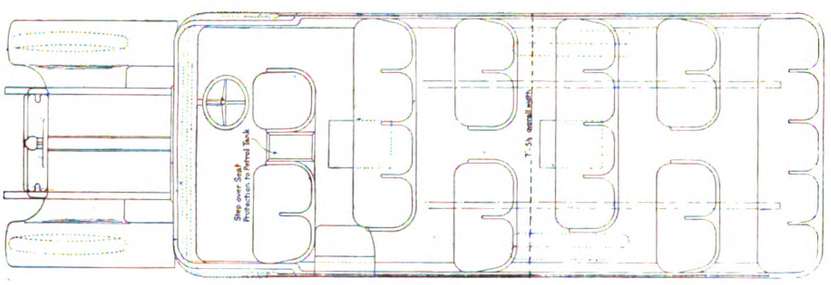
L.G.O.C. Motor Coach with Hood Folded—



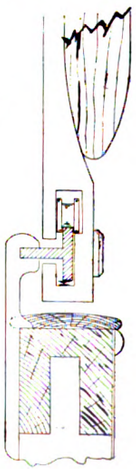
With Hood in Use.







Elevation and Plan of New L.G.O.C. Motor Coach.



Full Section of Hood Fitting.

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MOTOR TRAFFIC

compared with the company's earlier types, allows for more room per passenger and greater freedom for the knees. The seats are comfortably upholstered in green leather to match the colour of the outside panelling of the body. A slight cushion-like projection, separating each passenger's seat, adds greatly to the ease of the occupants. The bottom step below the door is so hinged that it can be unfolded and made wider when the vehicle is stationary, to facilitate ingress and egress.

The dimensions of the coach are as follow—

Over-all length	22 ft. 11¼ in.
Wheel base	14 ft. 2⅜ in.
Width	7 ft. 5½ in.
Height (with hood)	8 ft. 8½ in.
Rear over-hang	7 ft. 0 in.

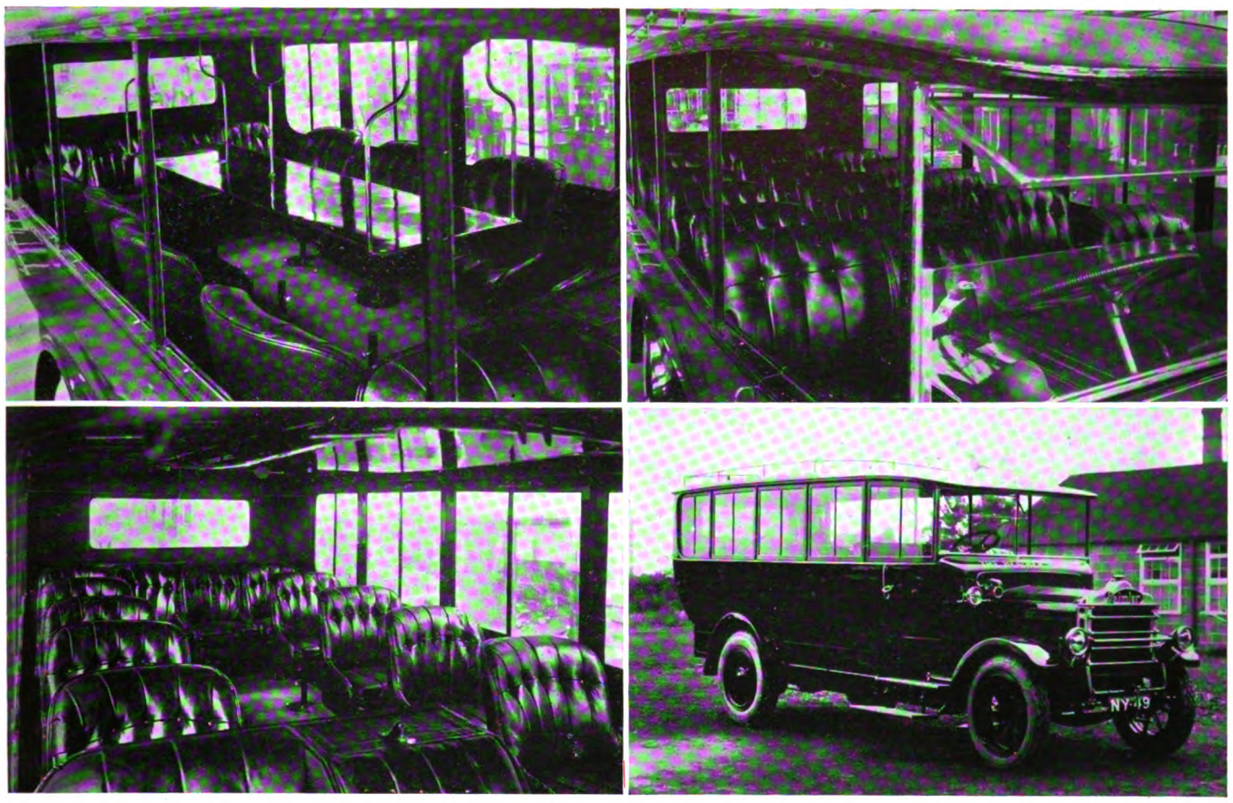
The coach is intended by the Private Hire Department of the company to be used chiefly for special parties, and is to be followed by three other similar vehicles now on the stocks. The special arrangement of the hood was designed by Mr. S. Gage, superintendent of the London General Omnibus Company's coach factories.

DAIMLER COACH DE LUXE.

ALL-WEATHER BODY AND PNEUMATIC TYRES.

Humphreys Garages at Pontypridd have become the fortunate possessor of the latest creation of the Daimler Motor Company, Limited—a luxuriously fitted coach suitable for traffic all the year round in any weather, and having seating equivalent to first-class travel. Credit for this development is due both to the purchaser and the builders, for the vehicle was constructed to order, and the order was the outcome of a Daimler exhibit at last year's Olympia Exhibition of Commercial Vehicles.

The illustrations on this page afford an accurate representation of the comfort to be enjoyed by the eighteen passengers for whom accommodation is provided in this vehicle, which runs on large-section pneumatic tyres. The chief features of the interior are comfortable armchairs upholstered in the best style, a table that can be folded away in the roof, and windows that can be raised and fastened to the inside of the roof. The table when opened hangs from the roof, and it can be made rigid by a support from the floor.



Daimler Coach for Travel in Any Weather—Seating 14 or 18 Passengers.

With four exceptions at the rear, and one by the side of the driver, the armchair seats are of the revolving pattern, and the four in the centre can be removed to provided a gangway, in which the table is placed. The chair sockets are removable from the floor. Thus the vehicle can be made suitable for carrying either 14 or 18 passengers, Passengers' luggage is accommodated in lockers below the whole length of the floor, and on the roof, which is provided with a guard rail. A tool locker is fitted behind the driver's seat.

The chassis is the C.K. type with a 13 ft. 6 in. wheel base, the Daimler sleeve valve engine being rated at 22·4 H.P. Entrance to the coach is by a door just to the rear of the driver.

REMOVAL OF CENTRAL STANDARDS IN GLASGOW.—At a joint meeting of the Tramways, Watching and Lighting, and Statute Labour Committees of Glasgow Corporation on August 17, it was decided to remove the standards in Great Western Road from the centre to the side of the street. The removal will cost about £2,000, and the clearance will be appreciated by the drivers of other vehicles.

LICENCE DUTY OF A CAR SENT OVERSEAS.—In the case of a motor car shipped to New Zealand on which the full licence duty had been paid, the Ministry of Transport have suggested that if the licensee decided to take out a new licence for another vehicle of a similar class for the same period for which the previous licence was in force, he would be entitled to an allowance of the value of the old licence towards the value of the new licence. The Minister could not see his way to recommend any refund of duty, save by way of an allowance towards such a new licence.

VULCAN MOTOR COMPANY'S LOSS.—The Vulcan Motor and Engineering Company, of Crossens, Southport, is reported to have sustained a loss of £434,261 for the fifteen months ended December, 1920. At the end of 1919 the business was acquired by Harper, Bean, Limited, and it had previously been very prosperous.

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MOTOR TRAFFIC

LAFFLY-SCHNEIDER SALOON OMNIBUS.

A Luxurious New Vehicle.

With a view to demonstrating the possibilities of the Laffly-Schneider saloon omnibus, Messrs. Laffly (England) Limited, of 14 Addison Avenue, Holland Park, London, W., recently arranged a tour round Great Britain, by which they claim to prove that motor travel by road can be made to equal, in comfort, railway travel by Pulman car.

The tour was to cover 14 days, ranging from 60 to 160 miles a day. Leaving London on the afternoon of September 5, the route was *via* Northampton, Sheffield, York, Newcastle-on-Tyne, Edinburgh, Glasgow, Carlisle, Preston, Chester, Birmingham, Bath, Brighton, Folkestone, to London, a total distance of some 1,220 miles. Such a tour is a severe test of the comfort of such a vehicle.

This Laffly-Schneider saloon omnibus is the first of its kind to reach this country, and the makers claim that its advent marks an appreciable advance in the evolution of motor travel. As regards coachbuilding, it clearly is a radical departure from previous models, combining the luxury of the limousine and the adaptability of the caravan with the capacity of the twenty-seater omnibus. Yet while in no sense can it be regarded as a rival of limousine, caravan, or omnibus, its usefulness will appeal to the admirers of all three. Externally the Laffly-Schneider omnibus is bound to ensure attention, if only by reason of its dissimilarity to all existing types. Its deep maroon, highly polished coachwork, surmounted by spacious plate glass windows, rounded at the rear after the fashion of an observation car, constitutes a novelty. The driver's seat, almost hidden behind a highly polished screen, gives a somewhat ponderous effect, otherwise the lines of the body are most pleasing. Immediately behind the driver's seat, steps of white aluminium on each side give access to the interior, through ordinary carriage doors.

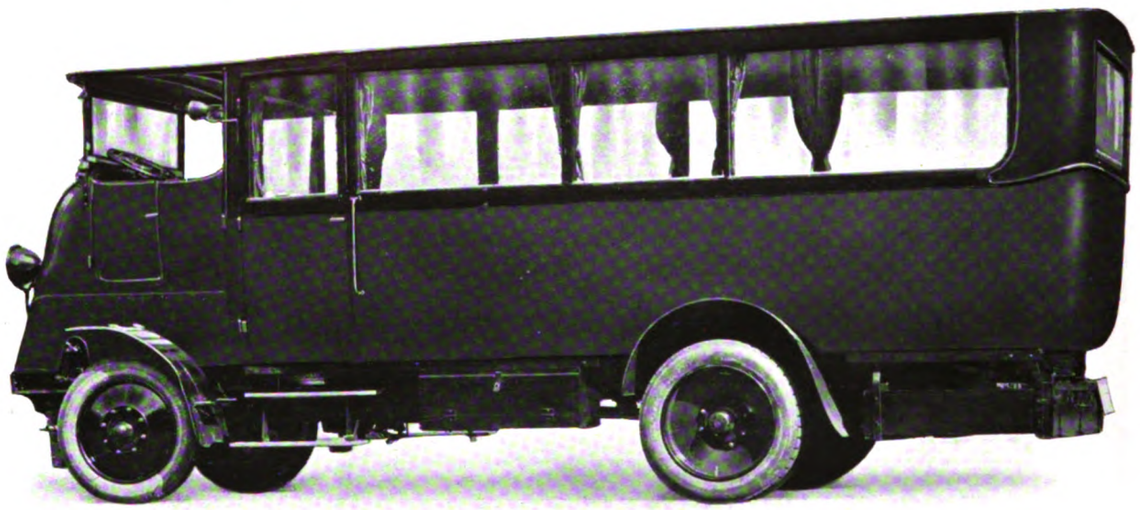
Interior Fittings.

It is on entering the vehicle that one first realises the notable advance which the designers have achieved. Upholstered in French grey repp cloth, with silver fittings at the back of the transverse seats, silver electroliers in the roof, silver cigar lighter and ash trays, the spacious frameless windows, extending completely round the car, combine to create an impression of luxurious comfort. The seats are disposed in twos, three on each side facing the driver, two behind facing each other, and two at the back under the observation windows, thus allowing ample space for a table between the rear seats. Comfortable seating for twenty people is afforded. A feature of the seating equipment is the luxurious springing of the seats, while at the corner of each upright back of the seat a silver handle affords passengers a grip to steady themselves when walking about while the car is in motion. For purpose of a caravan, the space occupied by these rear seats can be curtained off to permit space for a comfortable sleeping apartment, while the front portion could be easily adapted to a living room.

Specification.

This model vehicle de luxe is fitted with Michelin pneumatic tyres 955 × 155 mm., single front wheels and twin rear wheels. The fitting of pneumatic tyres to a vehicle of this weight is a daring innovation, but the tyres are tested to a strain of six tons, though the weight of the saloon with full complement of passengers is not expected to exceed four and a half tons. Two extra spare wheels and tyres were taken on the trip as a precaution. The engine is a four-cylinder, separate, with 105 × 150 mm. bore and stroke; solex carburetter; high tension magneto ignition; centrifugal pumps cooling; petrol tank under driver's seat; Hele-Shaw clutch; three forward and reverse speeds; cardan shaft transmission; irreversible worm and sector steering; foot brake acting on large diameter drum, 13¾ in., keyed on transmission shaft; and hand brakes on rear wheel drum, 21½ in. diameter. The chassis dimensions are—Overall length, 22 ft. 1 in.; wheel track, front, 3 ft. 1 in.; rear, 4 ft. 4 in.; wheel base, 12 ft. 7½ in.; overall rear width, 7 ft. 4½ in.; total weight of chassis, 3 tons 7 cwt.

The course selected for the trip includes many points where the hill-climbing power of the Laffly-Schneider will be fairly tested. On the other hand, the varying condition of the roads all over the country will, in turn, provide a severe trial for the pneumatic tyres. Messrs. Laffly (England) Limited are the sole concessionaires for Great Britain for the Laffly-Schneider vehicles.



Laffly-Schnieder Saloon Omnibus.

TYRES AND ROAD WEAR.

A Washington report states that the Bureau of Public Road, United States Department of Agriculture, recently made a series of tests at its experimental farm as to the exact amount of road damage that occurs from motor trucks. It was found by the Bureau that when a solid tyred truck strikes a 1 in. obstruction in a roadway the impact may be as high as seven times the static load—it averages about four times as heavy; when pneumatic tyres are used the impact under similar circumstances is seldom greater than 1¼ times the load. The Bureau state that as a result of these figures, they feel safe in predicting that roads now being built will bear all the loads that are expected of them.

Karrier Motor Vehicles.—Amongst the local authorities who have recently taken delivery of Karrier street scrapers are those of Manchester and Rotterdam. A large order for Karrier lorries received from the L. and S.W. Railway Company has just been completed.

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MOTOR TRAFFIC

WALLACE-PULLMAN OMNIBUS.

DEMONSTRATION AT HUDDERSFIELD.

A demonstration of the Wallace-Pullman omnibus, arranged by the Huddersfield Corporation, took place on Thursday, September 1, along routes in the Holmfirth district, over which the Corporation have secured running powers. A short time ago the Corporation asked the Wallace-Pullman Company to allow one of their new type of omnibuses to be used for a trial run in the locality. The company responded by placing an omnibus at the disposal of the Tramways Committee, who used it experimentally for several days on the Ravensthorpe and Golcar routes. For the particular demonstration referred to, a party of members of the Committee and officials of the Tramways Department were carried.

The chassis of the omnibus was constructed by the Richmond Motor Company, and the body by the Great Western Motors, of Reading. The vehicle is comparatively light, though strongly built. The weight, with full petrol tanks, is slightly over 2½ tons, and the tyres are pneumatic. The petrol consumption is claimed to be 14 miles to the gallon. The vehicle has an imposing appearance, and the interior is furnished in very comfortable and pleasing fashion. The seating capacity is 18. Leather upholstered chairs, installed separately, and with a convenient back-rest, are provided. Ample knee-room is allowed for, and the running of the omnibus is marked by agreeable smoothness.

During the demonstration, the two mechanics in charge showed how expeditiously it is possible to handle the tyres in case of puncture. That of one of the rear wheels was removed, the tube deflated, pumped up again by mechanical means from the motor, and the tyre replaced within 20 minutes. Representatives of the Wallace-Pullman Company explained the details of the omnibus to the gathering.

The party was entertained at tea by the chairman of the Tramways Committee (Alderman E. H. Sellers) and Mrs. Sellers, to whom a vote of thanks was proposed by the Mayor (Alderman Woolven), seconded by the vice-chairman of the Tramways Committee (Councillor T. Canby). The inspection was arranged by the general manager of the Corporation Tramways, Mr. A. A. Blackburn.

TILLINGS' NEW LONDON OMNIBUS.

In order to meet the present traffic requirements in London, and to take their part in reducing the congestion which has been so pronounced on the principal omnibus routes, the directors of Thomas Tilling, Limited, recently decided to replace the whole of their fleet of 34-seated petrol-electric omnibuses with a larger type, seating 48 passengers. Several of these are now in service, and are rapidly finding favour with the travelling public.

From the accompanying illustrations it will be seen that the design of the body gives evidence of considerable care and thought, for while the utmost has been made of all the available space, a pleasing appearance has been retained which is a distinct improvement on the old type of vehicle. All the body work has been executed in the company's works at Lewisham, and both for quality of material and workmanship leave little to be desired. The framing, including the pillars, rails, etc., are of selected English ash, morticed, tenoned, and ironed, the joints being set in white lead. The roof is supported on ash hoop stick, strengthened with iron plates extending across the body supplemented by four brass stanchions, the inner roof being finished in natural varnished pine. "Haskelite" panels are used throughout, finished with mouldings. The windows are of $\frac{3}{16}$ in. polished plate-glass, fitted direct to recesses in the frame, securely bedded with rubber rabitting and hardwood fillets. Special attention has been paid to the ventilation, which is effected by means of four ventilators of a somewhat novel type constructed to open outwards. All inside seats and backs are constructed on the spring system, and are covered in moquette. The outside seats are of the usual type, framed in ash. Aluminium roof-rails with round front corners are fitted; these are supported on steel uprights, which carry the necessary guard rails. Commode handles of heavy brass are fitted to the rear, while steel uprights support a solid drawn brass handrail to the staircase.

In order to obviate drilling or otherwise mutilating the chassis frame, the body is fixed to the chassis by means of clips. This method of fixing permits of the body being easily and quickly

Tillings' New London Omnibus.

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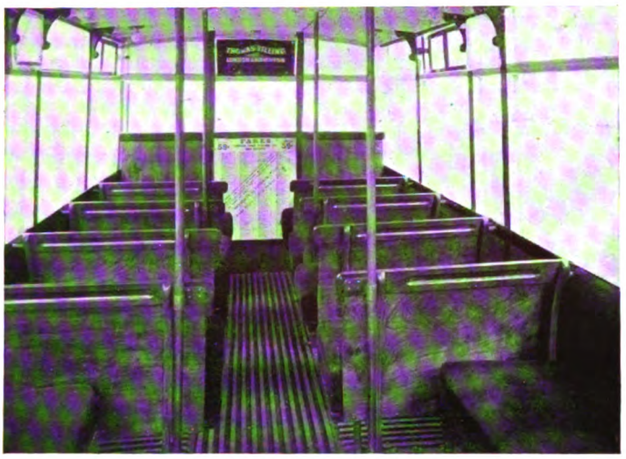
detached. The finish of the vehicles is quite in keeping with the high class coach work.

THE CHASSIS.

The chassis is the well-known Tilling-Stevens petrol-electric type, manufactured at Maidstone. Although in the main it conforms to the standard practice as followed in the company's T.S. 3A type, certain modifications in detail have been made in order to suit the conditions of the London omnibus services. The advantages of the Tilling-Stevens petrol-electric transmission system have been frequently referred to in these columns. The elimination of gear



Interior of Tillings' New London Omnibus.

and clutch and the consequent smooth and even motion render this type of chassis particularly suitable for passenger services, while the ease of control is always a strong point in its favour.

The most noticeable variation from the standard type chassis is the lengthened wheel base. This has been extended by 12 inches to 15 ft. 6 in., while the rear springs are now 2¾ inches wide. In order to secure a lower entrance, the spring brackets are so designed as to being the top of the chassis some four inches nearer to the ground. The engine is of the four-cylinder enclosed vertical type,

Top Deck of Tillings' New London Omnibus.

with a bore of 4¾ in. and stroke of 5½ in., cylinders cast in pairs. The pistons, in variation from standard practice, are the Ricardo aluminium, while the Simms Vernier coupling is fitted for the magneto drive. The valves are of large diameter, and interchangeable. Lubrication is entirely automatic, and is maintained by means of a combination of the forced feed and splash systems. Ignition is by "Thompson-Bennett" high tension magneto, driven from the camshaft by means of an enclosed skew gear. "Sphinx" sparking plugs are used, and the "Zenith" carburetter with a water-jacketed induction pipe. The cooling water circulation is maintained by a centrifugal pump driven by the same skew gear as the magneto.

The electrical equipment comprises the standard dynamo and motor supplied by Messrs. Tilling-Stevens with their type T.S. 3A4 chassis, without variation. A feature of the petrol-electric system is that the current for the electric lighting is taken from the main dynamo through a variable resistance to the batteries, no separate lighting dynamo being required. This resistance can be varied at will, according to the time of year. There is accommodation for 22 passengers inside and 26 outside. The plan of the seating arrangements will be seen in our illustrations. Sixteen of the inside passengers are carried on seats facing forward, and the remaining six on two longitudinal seats at the rear of the body.

MOTOR VEHICLES FOR MUNICIPALITIES.

HARROGATE CORPORATION have decided to purchase a Leyland motor fire engine at £1,642.

NEWARK TOWN COUNCIL have obtained permission to raise a loan of £1,700 for a motor fire engine.

BEDFORDSHIRE COUNTY COUNCIL'S annual report states that the cost of cartage by the Council's own motor vehicles was 6s. 9d. per hour, or 4s. per ton, compared with 8s. 10d. per hour, or 6s. 6½d. per ton by hired motor lorries.

BURNLEY CORPORATION Electricity Committee have instructed the engineer to obtain tenders for a 2-ton motor tipping wagon suitable for the cartage of ashes and coal. The Corporation Gas Committee recommend the purchase of a Sentinel 5-ton steam wagon at a cost of £1,060.

WALLASEY CORPORATION Highways Committee have been informed by the engineer that two motor lorries at present in use were frequently off the road for repairs, and he suggested the purchase of a third vehicle. The committee authorised him to obtain prices of a lorry chassis and a body, and to accept the lowest tender.

NOTTINGHAM CORPORATION Highway Committee's annual report states that the department now possesses one tractor and six wagons, two steam gulley emptiers, three steam wagons, four 5-ton motor lorries with interchangeable water tanks, four 4-ton motor lorries, five 2-ton motor lorries, three motor sweepers, one sweeping and loading machine, four electric motor lorries, and three motor cars.

BOLTON CORPORATION WATERWORKS COMMITTEE have decided to adopt motor transport in lieu of horse transport as being more economical. They recommend the purchase of a 1-ton Fiat chassis through Southern and Company, at a cost of £440, and also, when an old 5-ton steam wagon can be sold, the purchase of a 2-ton petrol wagon. The Corporation have asked the cleansing superintendent to furnish the Cleansing Committee each month with a report of the income and expenditure in connection with the motor vehicle now used for the removal of refuse.

L.G.O.C REFITTING DEPOT.—The central repair depot of the London General Omnibus Company at Chiswick is on the point of completion. The site has an area of 35 acres, but it is not at present fully utilised. By centralising the annual overhauling of the omnibuses the company anticipate being able to effect a saving of both expense and time. Hitherto the task of refitting an omnibus at the various depots has taken 15 days, but henceforth it will be accomplished in four days. The depot is many times the largest thing in refitting shops in this country, and is a climax to the wonderful progress of the motor omnibus during the past twenty years.

MR. PERCY FROST SMITH has resigned his position as joint managing director of Messrs. Tilling Stevens Motors, Limited. In conjunction with Mr. W. A. Stevens, Mr. Frost Smith was responsible for the design and manufacture of the Tilling-Stevens petrol-electric system of transmission, which has become the standard of "Tilling" motor omnibus services, the Birmingham motor omnibus services, and many others throughout the country. Mr. Frost Smith has had an exceptional experience with motor transport dating from its very inception. It will therefore be of special interest to our readers to know that he has been invited to read a paper at the forthcoming congress in connection with the Institute of Transport which will be held at Olympia in October.

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OMNIBUS SERVICES.

PRESTON AND SOUTHPORT.—The Southport Watch Committee have licensed twelve omnibuses which are to run from Preston to Southport daily.

KENT.—The London General Omnibus Company have started a service from Bromley to Sevenoaks, where passengers can change into vehicles running to Tunbridge Wells.

LIVERPOOL.—There was a loss of £41,224 on the Liverpool Corporation omnibuses last year. The receipts were £46,534, but the expenditure, including interest and depreciation, came to £87,759.

SOUTH SHIELDS.—The tramways report for the year ended March 31 last indicates a slight improvement in the omnibus service receipts, but the total is not yet sufficient to meet all capital charges, there being a debit balance of £307.

TAUNTON.—The Town Council of Taunton—where the company-owned tramway service was withdrawn several weeks ago—have accepted the offer of the National Omnibus and Transport Company to run an experimental motor omnibus service in the borough.

ST. HELENS.—The Corporation have decided to run motor omnibuses while the tramway track is being reconstructed. Two vehicles will be leased from the Bristol Tramways and Carriage Company for a period of two months. It is suggested that permanent motor services should be established, linking up Rainford and Billinge.

AYR.—The County Road Board have decided to apply to the Ministry of Transport to make an order under Section 7 (4) of the Roads Act, 1920, to restrict the running of omnibuses to routes which have a width of not less than 16 feet of metal bed, and subject to the proposed time table and fares being approved by the County Council. The Board have also decided to recommend that the width of the omnibuses should not exceed 7 ft. 6 in. and the length 25 ft. 7 in.

SUSSEX.—Opposition is being formulated to the application of Eastbourne Rural Council to the Ministry of Transport for sanction to close to coach and omnibus traffic four miles of the coast road from Eastbourne to Seaford and Brighton. The Council contend that the Ministry is not giving sufficient financial support to the maintenance of the road, and the surveyor estimates that at the present rate of progress the road will not be fit for the heavy traffic in thirty years.

NEWCASTLE.—On August 14 the Corporation omnibus service between Scotswood Bridge and Crawcrook was extended and omnibuses now run to Crawcrook, Ryton, Wylam, Prudhoe, and Mickley, and terminate at Bridge End, within a short distance of Stocksfield, a favourite valley resort of Tyneside residents. The distance now covered by the route is nine miles and the fare for the whole journey is 1s. 3d. On Monday of each week (auction mart day) a special service is run on the Ponteland to Newcastle route for the benefit of farmers.

MERTHYR.—On August 23 the Corporation decided to purchase three omnibuses, the type being left to the consideration of a sub-committee. It is intended to run between Merthyr and the townships in the valley, if the latter give consent. One of the members of the Council stated that numerous applications were being received from motor vehicle proprietors to ply for hire on this route. As the Corporation were spending money on repairing the roads, he contended that they should get the return for their expenditure instead of the private firms now running omnibuses and coaches.

SURREY.—The East Surrey Traction Company are opening up services in the northern part of the county, which, as far as main roads connecting with London are concerned, has until now been worked only by the London group. On August 15 a service was instituted from Redhill to Croydon, the terminus in the latter town being at the side of West Croydon Station. The vehicles run half hourly both ways, and it is proposed in a short time to extend the service to Crawley. Double-deck machines are utilised. For new cross country services from West Croydon Station to Sevenoaks and to Edenbridge single-deck cars are run. The three services connect at Croydon with those of the London General Omnibus Company.

LONDON.—The London General Omnibus Company propose to institute several new routes within and outside the county boundary in order to give access to various districts without passengers having to book to central London and then out by another radial route. Single deck omnibuses will be used. One notable outer circle service has been in existence for several years, operated with double-deck omnibuses. It connects Shepherds Bush with the Crystal Palace, via three of the Commons—Wandsworth, Tooting Bec, and Streatham—and has this year been extended from the Palace to Lewisham. Some of the proposals would have been put into operation before but for the opposition of local Councils, whose veto, however, ended on August 31 with the falling through of the Emergency Provisions Act, 1916.

PORTSMOUTH.—In the report of the Tramways Committee for the year ended March 31, 1921, presented to the Corporation on August 9, it was stated that the revenue from the omnibuses had increased from £6,716 in 1920 to £16,826 in 1921, but the expenditure had increased from £9,804 to £22,475. The deficit was £5,649 against £3,088 the previous year. Councillor Hooper urged that any enterprising business man would scrap the omnibuses. The Mayor (Councillor J. Timpson, who is chairman of the Tramways Committee) asked how they could reduce expenditure when they had to maintain services which were demanded by the public. The Council adopted a recommendation by the Committee that a month's trial should be given to a proposed service from Eastney to Cosham, Councillor Gourd withdrawing an amendment to refer the proposal back for further consideration. Alderman Stobie urged that the heavy double-deck type of omnibus was unsuitable for Portsmouth. The Mayor observed that there did not seem to be anyone capable of putting down a road able to carry the traffic. Until this was done there would always be complaints of the expense of the roads.

GLASGOW.—The Corporation have adopted a report of the Committee on Tramway Extensions, recommending that application be made in the Provisional Order for powers to run omnibuses from the centre of the city to all districts within a radius of ten miles from Glasgow. Commenting on this decision, the *Glasgow Herald* says—"The highways leading from Glasgow are admirably suited for an omnibus service, and the development of such traffic has been kept in view in the formation of the road under construction between Shawlands and Bellahouston. Within the city the omnibus, being independent of a railed track, could choose its course, make short cuts, and tap neighbourhoods where it might be inconvenient to lay tramway rails. Judging by the recent experience of other local authorities, the application by the Glasgow Corporation is unlikely to go unchallenged, and county authorities, into whose domain the civic omnibus seeks to penetrate, may raise the question of road maintenance. But the omnibus is so inevitably a medium of passenger transport, and is so increasingly favoured by so many important municipalities, that Parliament will eventually be compelled to adopt measures to remove all hindrances to its progress."

KARRIER OMNIBUS AT ROYSTON.

For excellence of design and high quality of the coachwork, the latest type of Karrier omnibus, illustrated below, sets a high standard. The vehicle has been delivered to Mr. T. Wombwell, of Royston, Barnsley, whose public passenger services have been

New Karrier Omnibus in Service at Royston.

running for many years and have obtained a reputation for comfort as well as reliability. This neat body gives the maximum accommodation in seating, and while passengers and driver are completely enclosed during bad weather, there is ample ventilation. For fine weather the side windows can be lowered. The chassis is the latest model K4 from the Karrier Works at Huddersfield, designed for loads of three to four tons. The vehicle is electrically lighted.

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MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

BURNLEY CORPORATION AND SPEED LIMIT.—Being of opinion that cases of excessive speed can be dealt with under the existing law, the Parliamentary Committee of Burnley Corporation refuse to support a resolution "for such speed limits as will prevent the existing nuisance and danger."

NEW LANCASHIRE BY-PASS ROAD.—Lancashire County Council have resolved to construct, at an estimated cost of nearly £70,000, a by-pass of the Liverpool and Preston highway, in order to obviate heavy transport, such as cotton-laden motor lorries and trailers, passing through the narrowest street of Ormskirk.

KENT'S MOTOR COACH BY-LAW.—Kent County Council have passed a new by-law prohibiting the blowing of horns or the use of other noisy instruments and loud singing by motor coach parties on Kent roads. The regulation also makes it an offence to throw money from such vehicles to be scrambled for by children or other persons.

WAITING PLACES FOR CARS.—The Automobile Association announce that motorists who visit Coventry, Birmingham, Leicester, or Peterborough may leave their cars unattended for any length of time, without police interference, at special waiting places authorised by the chief constables. Other places are expected shortly to give similar concessions.

NEW AMERICAN STEAM CAR.—The Coats Motor Company, of Indianapolis, U.S.A., have produced a five-seat touring steam car which weighs 16 cwts. 8 lb., which is about the average weight of a petrol car of the same seating capacity. The engine is combined with the rear axle, and running at 500 revolutions per minute it gives a road speed of forty miles an hour.

FUEL STATIONS IN LONDON.—Open-air stations for the replenishment of the tanks of motor vehicles have been opened on private ground in Westminster Bridge Road and at the south-east corner of Vauxhall Bridge Each station provides accommodation for six vehicles to take their stand at the pumps. The tanks are placed underground, and the roadway is of concrete.

FUEL FROM CHARCOAL IN THE SOUDAN.—Mr. G. B. Middleton, of Cairo, chief engineer of the Soudan Cotton, Fuel and Industrial Development Company, recently visited New Orleans, U.S.A., and stated that the company obtains fuel for motor vehicles from charcoal. Timber is converted into charcoal and thence into dry gas. This fuel costs about one-sixth of the price of petrol.

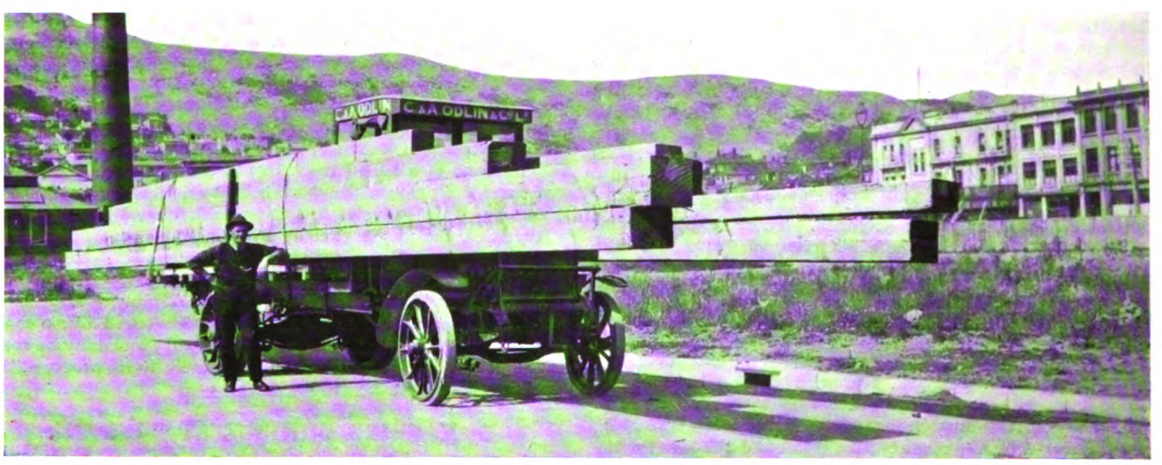
NO SIDE-CAR TAXICABS FOR LONDON.—On August 16 the Home Secretary stated in the House of Commons that, in view of the recommendation of the Departmental Committee on the Taxation and Regulation of Road Vehicles, dated January 6 last, it was not desirable that licences should be granted to side-car taxicabs to ply for hire in the London area at present, and it was too early to reopen the question.

CONCESSION TO LIVERPOOL CAB DRIVERS.—As a result of objections raised by taxicab drivers to the Corporation omnibuses running from the landing stage to the railway termini, the Tramway Committee agreed that until the end of August the omnibuses should ply only on Saturdays and Mondays from the tramway terminus at the pierhead, instead of going along Prince's Parade where the passengers from the Manx and North Wales steamers land.

THE ROADS OF PERTH.—According to the annual report of the Perth Highland District Committee of the Perthshire County Council, there is now more wear on roads because of increased use of motors of all descriptions. Roads still suffer from continuous wood haulage. Most of the main roads need strengthening to enable them to withstand the increased traffic, but unless material and labour decrease in cost, many years must elapse before roads are brought back to their pre-war condition.

CERTIFICATES OF NECESSITY FOR OMNIBUSES.—A new by-law instituted in the State of Washington, U.S.A., provides that all motor omnibus operators must first obtain a "certificate of necessity and convenience" from the Department of Public Works before being allowed to operate. The Puget Sound Navigation Company have filed a protest against certificates being issued to motor companies which desire to continue operation, the company contending that omnibuses create unfair competition with the steamships.

TRIBUTE TO A.E.C. LORRY IN NEW ZEALAND.—The sterling capabilities of the lorries manufactured by the Associated Equipment Company, Limited, of Walthamstow, is shown by the photograph reproduced below. This lorry is owned and operated by Messrs. C. and A. Odlin, of Wellington, New Zealand, and its work is described in a letter received from Messrs. Inglis Brothers, and Company, Limited, of Wellington, the New Zealand Agents of the A.E.C. "This truck," the writers state, "has been carrying eight loads a day for the last three weeks, and is still engaged on this work. The load carried is 6 tons, the dimensions of the heaviest baulks being 50 feet long by 10 inches square. This is certainly a tribute to the capabilities of the A.E.C."



A.E.C. Lorry Transporting Heavy Timber Load in New Zealand.

TRAFFIC SIGNALS AT BRIGHTON.—The driver of a motor vehicle who was summoned for failing to stop when signalled by a constable on point duty at Brighton, pleaded that he did not understand the signal. The chief constable stated that it was ridiculous for motorists to say the signals were not understood. There were only three signals. When traffic was coming towards a constable he held his arm vertically for a stop; when it was coming from behind he held his arm horizontally for a stop; and the only other signal was a swinging movement to wave traffic on.

JAPANESE MOTOR BOUNTIES.—Since March, 1918, the Japanese Government have paid a bounty of £40 for each motor lorry built by a native manufacturer to specifications laid down by the War Department. The minimum load capacity is one ton. An additional £10 is paid to the maker if the vehicle is let out on hire. Purchasers receive a bounty of £20, together with £6 per annum towards upkeep for five years. Users are said to prefer the more reliable vehicles from other countries. Japan has to import most of the raw material for the manufacture of motor vehicles. In December, 1919, there were only 209 lorries in use throughout Japan. The small number is due to the bad condition of the roads and the narrowness of streets.

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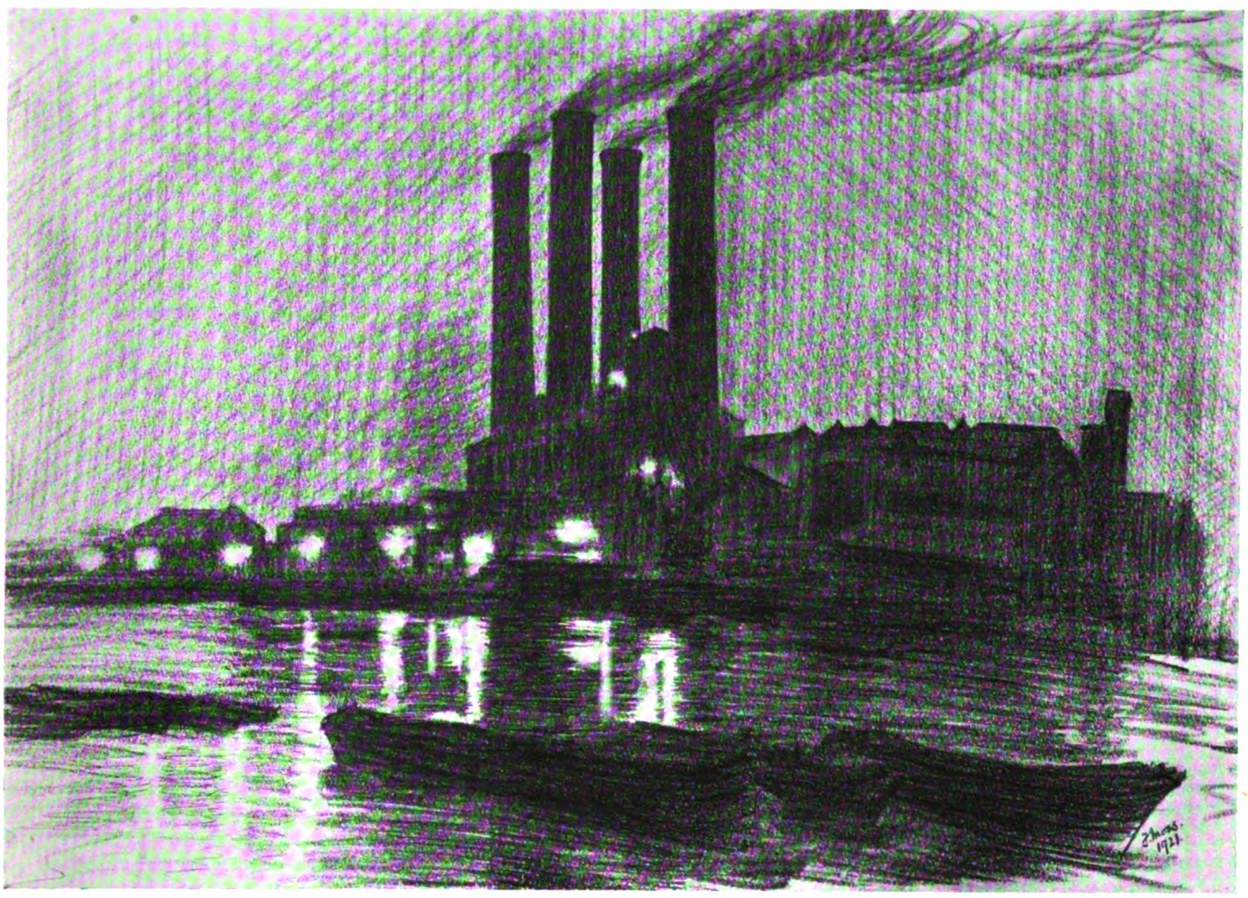
THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, OCTOBER 20, 1921. VOL. L.

CHELSEA POWER STATION—LONDON UNDERGROUND RAILWAYS.

NEW EQUIPMENT RECENTLY INSTALLED.

The important developments which have taken place during the last few years in the equipment of the power house of the Underground Electric Railways Company of London at Lots Road, Chelsea, render it desirable that descriptions of this plant that have appeared in these pages from time to time should be supplemented and brought up to date. The important augmentation of the train services which took effect at the beginning of October was largely made possible by the increased power now available, combined with new rolling stock, fresh signalling devices and structural rearrangements at stations to facilitate the despatch of traffic. During the war, when one large new power unit had been installed at Lots Road, the circumstances of the time precluded any adequate record being made of such a step forward; but these restrictions, of course, no longer exist. The fact that the Lots Road power house is one of the largest in the world ensures that the interest manifested in it by engineers and others concerned in passenger transport is not confined to this country. Indeed certain features of the equipment have led to the adoption of similar improvements at power stations in various parts of the globe. A comprehensive and detailed account of the station was given in the TRAMWAY AND RAILWAY WORLD of February, 1905, shortly after its completion.



[*Drawn by Fred Moss.*

Lots Road Power Station, Chelsea, as seen from Battersea Bridge at evening.

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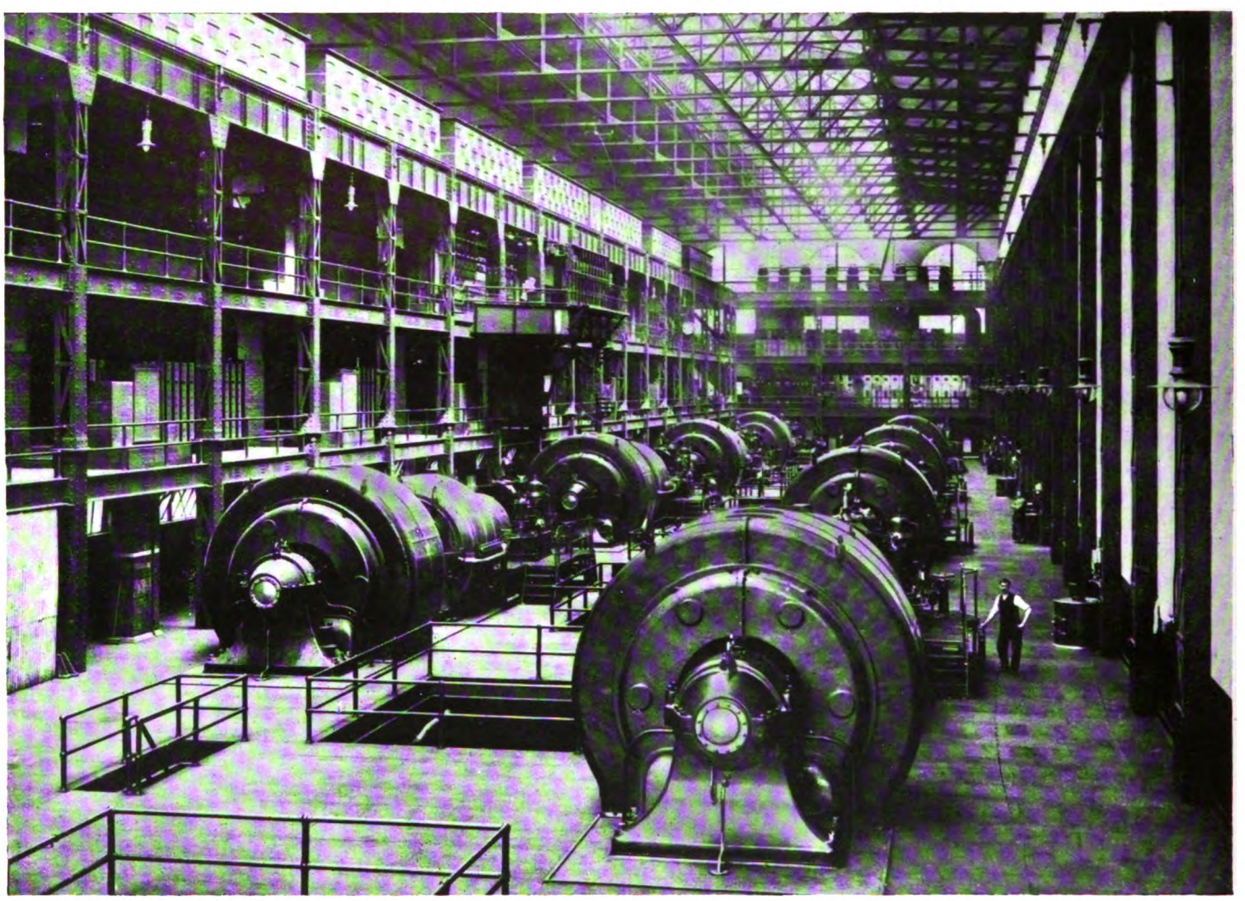
The site occupied by the station has an area of over three and a half acres, with a water frontage on the Thames and on Chelsea Creek of 1,100 ft. The principal building has a length of 453 ft., a breadth of 175 ft., and is 140 ft. high. It has a steel framework and the walls are of terra cotta and brick. The roof is constructed of concrete and glass. The station's four great chimneys, 275 ft. in height, form a landmark for many miles around.

Prior to 1915, the main power plant consisted of eight turbo-generators, originally rated at 5,500 KW. but later at 6,000 KW. each. These units, which are still in service, produce three-phase current at a pressure of 11,000 volts and a frequency of 33⅓ cycles. They run at a speed of 1,000 revolutions per minute.

In 1915 it became necessary to add to the plant, and a 15,000 KW. three-phase turbo-alternator was installed. This was manufactured by C. A. Parsons and Company, Limited, of Newcastle-upon-Tyne, and is of their standard tandem reaction type. It has a full-rated continuous capacity of 18,000 KW., and operates at 1,000 revolutions per minute. The voltage is 11,000 and the periodicity 33⅓. The condenser for this machine has a cooling surface of 30,000 square feet, and was manufactured by W. H. Allen, Son and Company, Limited, of Bedford. It is capable in normal duty of condensing 180,000 lbs. of steam per hour. The vacuum guaranteed under this duty is 29·1 in. (barometer at 30 in.), with the circulating water supply at 50 deg. Fahr. The auxiliary pumping equipment is of the kinetic ejector type, driven by an alternating current motor. There were also installed in duplicate, circulating water pumps, each driven by a 550-H.P. motor, for supplying circulating water (taken from the Thames) to the condenser set.

In order to provide for this increased capacity, it was found necessary to arrange for a new circulating water service. This comprises an underground tunnel, which was driven by a shield, connecting the west end of the power station with the Thames. The internal diameter of this tunnel is 7 ft. 10 in. It is divided by a partition into two halves, the uppermost being used for the inlet circulating water, while the bottom portion carries the discharge from the condensers. In connection with this circulating water system, a large new screening pit for removing any floating matter from the water taken from the Thames has been made. Inside the pit are installed two circulating water revolving screens, each of which is self-contained and motor-driven, the motor being carried on the screen itself. In order to provide for the maintenance of the screens, an overhead gantry crane, spanning the pit, has been erected. This has two lifting barrels that allow the screens to be lifted bodily out of the pit by means of chains fixed at four points.



The Turbine Room, showing the Old 6,000-k.w. Turbo-Alternators.

Another noteworthy addition made to the outside equipment of the Chelsea station about this time was a very large coal storage tank of rather original design. The tank, which is 95 ft. in diameter, is constructed of heavy steel plating and has a storage capacity of 14,000 tons. Across the top are fixed steel trusses bearing a set of rails on to which can be run the carriage, with its grab, from one of the old coal-handling equipments. Coal can thus be lifted from the tank and deposited into an adjoining hopper, from which it gravitates on to the coal-conveyer belt leading to the

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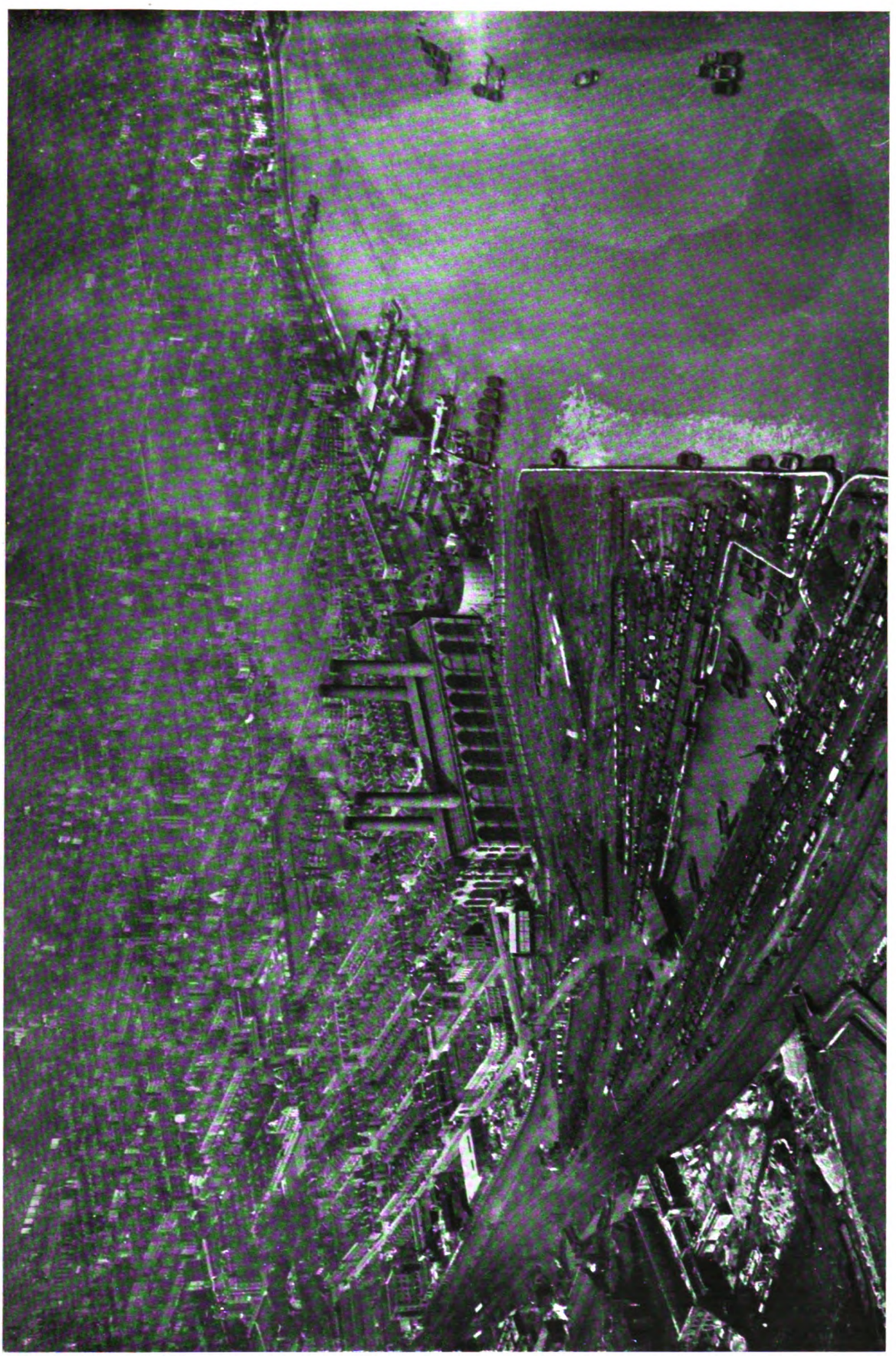

[*Central Aerophoto Co*

Lots Road Power Station of the Underground Railways Company of London, Limited.

An aerial photograph showing a part of Chelsea and of the Thames just above Battersea Bridge. In the foreground is seen the West London Extension Railway and Chelsea Basin.

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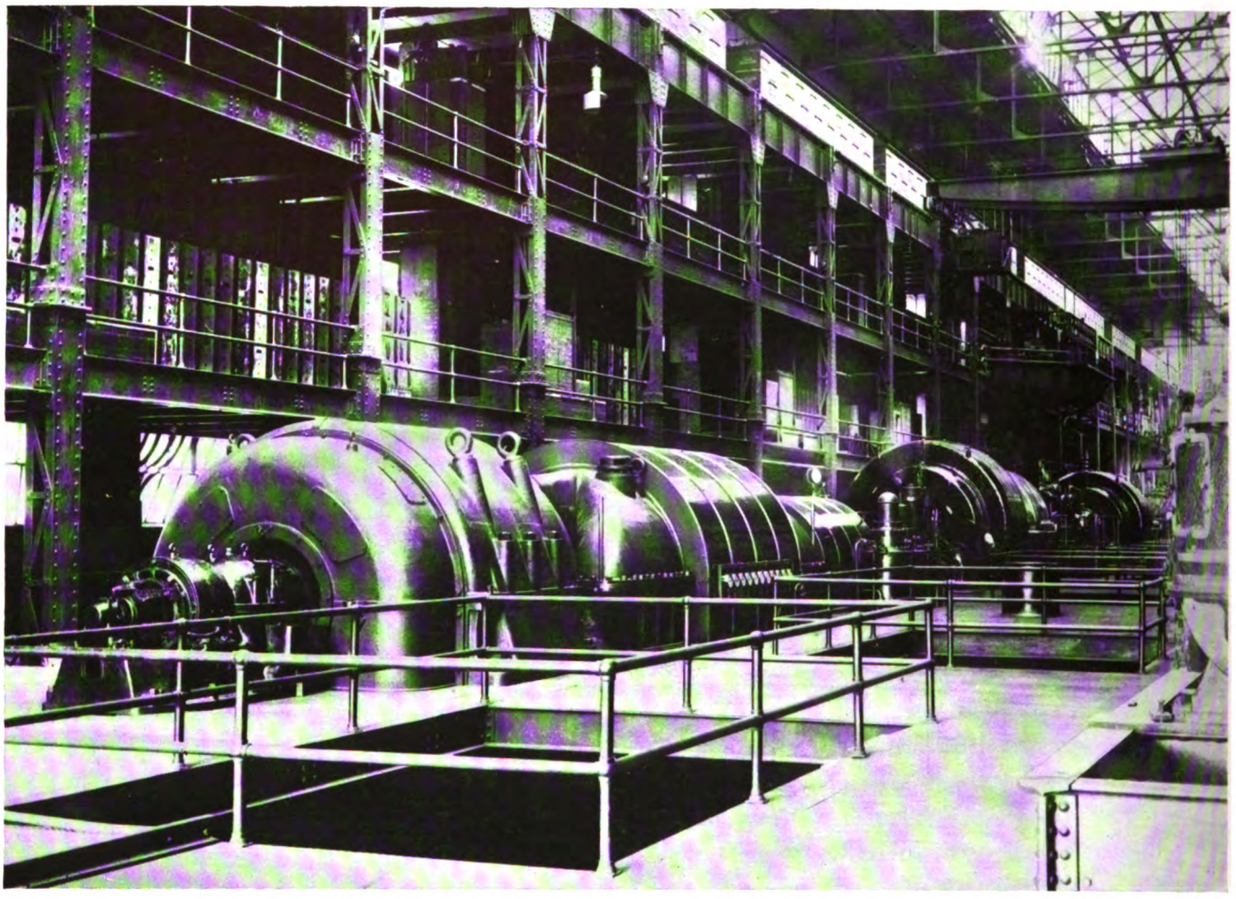
boiler house. When, however, the storage tank is full, the coal from the upper portion can be fed on to the conveyer belt by gravitation through an opening in the side of the tank, the grabs only being used when the fuel gets below a certain level. Provision is made for flooding the interior of the tank and the coal is generally kept under water. This not only prevents spontaneous combustion, but counteracts the tendency for the coal to deteriorate slightly when exposed to the atmosphere.

The latest development at the Lots Road power house is the installation of a new and up-to-date turbo-generator of the latest type, which has just recently been put into operation. It should be recalled that even before the war, the need was realised for this second of the two latest power units, but before the makers could put the order in hand the national emergency arose and necessitated a compulsory suspension of the contract. When the war ended, the work was put in hand and the tenth generator at the station is now helping to cope with the heavy demands for current that are made by the traffic on the company's various lines. This machine represents a considerable departure from the previous one, inasmuch as the speed is 2,000 revolutions per minute, as compared with 1,000 revolutions per minute for the last machine. The capacity is similar to the other generator, viz., economic rating 15,000 KW., full-rated continuous capacity, 18,000 KW. The voltage (11,000) and the periodicity (33⅓) are also the same. This turbine is also a tandem reaction machine of the Parsons standard type, while the alternator is the product of the Metropolitan-Vickers Electrical Company, of Trafford Park, Manchester. The alternator is provided with an air filter attached to the foundation block. The condensers are practically a duplicate of those supplied for the first set. The auxiliary pumping plant in this case, however, is driven by a small auxiliary steam turbine, the exhaust steam from which passes into a feed water heater, which receives the condensate from the machine. A third circulating water pump, exactly similar to the two previously supplied, has also been put in.

An interesting feature of the latest turbine is that, in the first place, it will be worked on the present ordinary steam pressure at Lots Road—185 lbs. pressure and 500 deg. Fahr. total steam temperature. It is, however, intended that all new plant installed at the Chelsea station shall be capable of operating on higher steam temperatures, the figures decided upon being 275 lbs. per square inch and the total temperature 650 deg. Fahr. This second turbine has, therefore, been so designed that when it is desired to run on the higher steam pressure, a number of extra blades will be fitted to the high pressure spindle.



One of the New 15,000-kw. Turbo-Alternators—Chelsea Power Station.

Important additions are also to be made to the boiler plant. This originally consisted of 64 Babcock and Wilcox patent water-tube boilers of that company's standard land type, each having 5,212 sq. ft. of heating surface and capable of evaporating 17,000 to 18,000 lbs. of water per hour. These are arranged on two floors, in groups of eight. There are now being added four new boilers of the cross type, marine pattern, manufactured by Babcock and Wilcox. They will be

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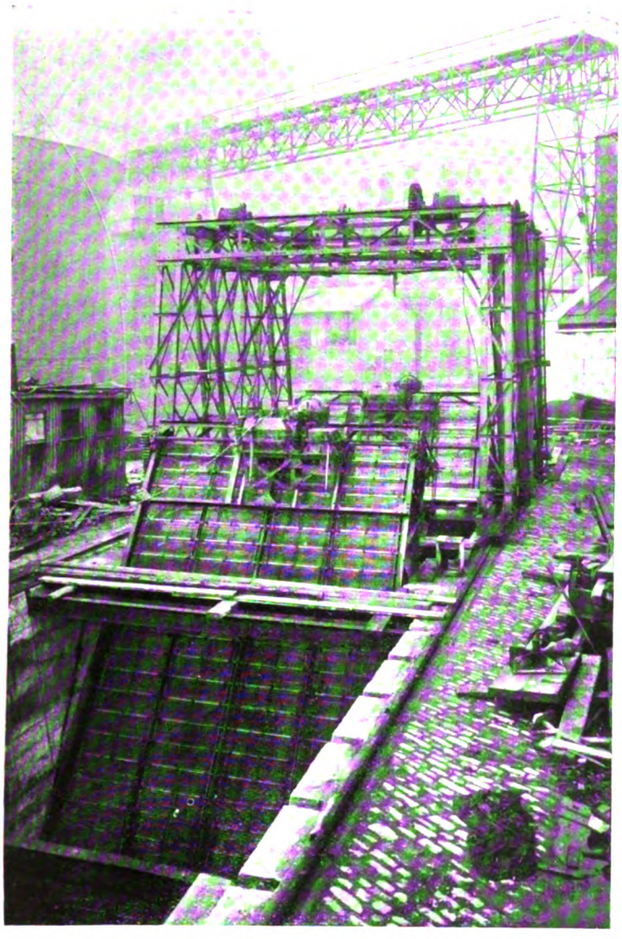
located on the first floor, complete with the superheaters. The economisers, which will be of the Babcock and Wilcox type, with steel tubing, are to be erected on the second floor, immediately above the boilers. The capacity of each of these boilers is 39,000 lbs. of water evaporated per hour. They will be furnished with chain grate stokers made by the same firm. Forced draught equipment will be installed, as will also induced draught plant. For both of these systems, motor-driven fans will be used. As regards the supply of coal for the new boilers, there are already spare bunkers at the west end of the power house and from these coal will be taken through chutes and automatic weighing gear. A visit to the boiler feed-pump house



Condensing Water Plant.
Pit showing screens and overhead travelling lifting gantry. Above the gantry is the coal-conveyer.

shows that all the original plant of the reciprocating type has been replaced by centrifugal feed pumps driven by steam turbines. Part of these were manufactured by the British Thomson-Houston Company, Limited, of Rugby, and the remainder by G. and J. Weir and Company, of Glasgow.

The coal-handling equipment, which includes gantry cranes spanning the large barge basin, to which coal is shipped up the river, had not been much increased until the present year, when facilities were provided for taking coal from barges moored in Chelsea Creek, adjoining the boiler house. The new equipment comprises, in the first place, a steel tower fixed over the end of the existing coal-conveyer belt. This tower is provided with coal-receiving gear, including a hopper, chutes, automatic weighing mechanism (by Avery's), and a motor-driven coal crusher. Coal is conveyed to the tower by means of a locomotive crane, electrically driven, made by Thomas Smith and Sons (Rodley), Limited, of Rodley. This crane, which is fitted with a grab capable of lifting about two tons of coal, can be worked at a normal radius of 25 ft., and has a capacity of over 40 tons per hour.

It may be added that the oil fuel plant, which was installed during the recent coal strike as an emergency measure, has now been removed. From the foregoing it will be seen that taking the original installation of eight generators as of 6,000 KW. each and adding the two latest generators, each with a normal capacity of 15,000 KW., the aggregate power capacity of the Chelsea station is now over 78,000 KW.

CHILEAN RAILWAY ELECTRIFICATION.

EQUIPMENT OF VALPARAISO—SANTIAGO LINE.

The Westinghouse Electric International Company announces that it has received the final confirmation of the contract to supply the equipment for the electrification of the Chilean State Railroad between Valparaiso and Santiago, and also the Los Andes branch. This contract, which was received from the Chilean Government through the company's Chilean agents, Errazuriz, Simpson and Company, associated with Spruile Braden of New York City, covers the most important undertaken since the beginning of the war, and the largest undertaken abroad by an American firm.

The main line, which is 116 miles long, is now worked by steam locomotives, and is the most important line in Chile. It connects the leading seaport (Valparaiso) with the capital (Santiago), while the line to Los Andes is 28 miles long, and forms the Chilean State Railway section of the trans-continental line to Buenos Ayres. The contract, which has a total value of 7,000,000 dollars, was secured in keen competition from Germany and other European companies.

The equipment to be furnished consists of eleven local passenger locomotives, fifteen goods locomotives, six express locomotives, seven shunting engines, and five sub-stations of 4,000 KW. capacity each. The 3,000 volt direct-current system will be used, and will be of the usual American character. The capacity of this equipment will be 50 per cent. greater than the present traffic demands, and the plans have been so drawn that an increase of traffic capacity equal to three times the present demands can readily be obtained. Owing to the abundance of water-power in Chile, and the high price of fuel, all of the Chilean railroads will eventually be electrified, and the present project is the first step in this direction. All the new locomotives above referred to are of Baldwin-Westinghouse manufacture.

This contract represents the third large order for electric railway supplies received by the Westinghouse Electric International Company from foreign countries in the past few months, the others being obtained from France and Japan. Other American concerns who received contracts for requirements of the Chilean Railroad are the American Locomotive Company, Pressed Steel Car Company, and the Anaconda Copper Mining Company. The Errazuriz, Simpson Company, of Chile, will erect the overhead equipment. The Anglo South American Bank has been informed that the Chilean Government has authorised the Minister at Washington to accept a proposal by New York bankers for the loan of 25,000,000 pesos gold of 18 d. and 10,000,000 dols., which will probably be used for the electrification of the railways.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, OCTOBER 20, 1921.

The Municipal Tramway Year.

Tramway operators have crowded almost a lifetime of activity into the seven years that have elapsed since civilisation received the blow from which it is still reeling. In the solution of their problems the individual undertakings in the civic field have found a tower of strength in the Municipal Tramways Association. This organisation was excellently served by hon. secretarial workers until a few years ago, and a study of the current annual report shows that the happiest results have followed the installation of a permanent general secretary with headquarters in London. Never in its history has the Association had to deal with so many difficulties as those which arose during 1920-21. Time after time the question of arriving at satisfactory permanent or temporary arrangements has depended upon promptness of action on the part of the Executive Council. On every occasion they have been served with distinction by Mr. Beckett, the general secretary, whose geniality and perception are invaluable assets in dealing with the many controversial subjects requiring delicate handling before and after consideration by the Council. The best testimony in this regard can be given by the managers and chairmen of the ninety-five undertakings that have looked to headquarters in their perplexities. It is surely an oversight that no mention was made in the annual report of his services to the committee of general managers who prepared and submitted the case for municipal authorities at the expensive Court of Inquiry in March last. That inquiry and the proceedings of the National Joint Council loom most prominently in the many branches of work that have occupied attention. Decidedly the formation of the National Council has been worth while, and not the least valuable aspect of their work has been the early consideration given by a Joint Standing Committee of employers and employed to cases of dispute arising on both municipal and company-owned undertakings in connection with the 48-hour week agreement. In every instance satisfactory settlements have been arrived at, and a point worthy of attention is made by that committee in appealing for the early reference to them of doubtful matters. It is impossible here even to enumerate the varied items that engaged the attention of the Municipal Association's Executive during the year. Several of the subjects will continue to claim urgent attention, notably the alleviation of legislative burdens on the industry. Those portions of the report which deal with tramway finance serve to emphasise the need for British industry to return to an economical basis. Notwithstanding that forty-two municipalities had taken advantage of the new legislation for granting an increase of statutory fares, thirty-three undertakings had to receive aid from the ratepayers. There is no need to point the moral.

Motor Omnibus Competition

The outstanding feature of the annual conference of the Municipal Tramways Association was the attention that was concentrated on the unrestricted competition by motor omnibuses and on financial difficulties. In the present state of affairs these are indeed all-absorbing. The vital trouble of the moment is the probable effect of the Roads Act of 1920. Mr. J. B. Hamilton raised the subject in the timely and forcible paper which led to the most important discussion that has ever engaged the attention of the Association. By the passing of the Act

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referred to and by the lapse, with the official termination of the war, of the Local Government Board's Emergency Road Legislation Act, the situation has become acute. The latter Act gave local authorities working tramways considerable power to prevent undue competition. Under the Roads Act the Ministry of Transport is empowered to prohibit or restrict the driving of vehicles where it is proved that they cannot be used without danger to themselves or other traffic, or that the highway is unsuitable. By inference it follows that whenever application is made for a licence for an omnibus to ply for hire, the application must be granted unless there are valid reasons for refusing it. There is an appeal to the Minister against unreasonable refusal. It is also inferred that a licensing authority would not be justified in refusing a licence merely on the ground that the proposed vehicles would compete with tramcars or omnibuses of the local authority. Mr. Hamilton pointed out clearly the alarming prospects which this condition of affairs might open up. He, however, also put the alternative that the Minister might say that if a road is sufficiently served by a statutory tramway undertaking the proposed vehicles are unnecessary, and he might accordingly uphold the licensing authority in refusing a licence.

Question of Monopoly.

It is possible, therefore, that things may not turn out so badly as the municipal tramway authorities fear, but they passed a resolution affirming that the Roads Act encourages wasteful overlapping competition and providing for representations being made to the Ministry of Transport urging the statutory regulation of competition. The municipally-operated tramway is an established institution, and it must so remain. There can hardly be a doubt that Mr. Hamilton is right in contending that Parliament intended that tramways where they exist should be a monopoly, just like other public utility services. Tramways can only be established after searching Parliamentary investigation as to the need for them, and in granting powers the rights of all parties interested are carefully safeguarded. Then the undertaking can only be constructed and equipped at great cost, and such expense would not be justifiable unless the tramway had a monopoly. The evils usually associated with the word monopoly do not exist in the case of tramways, as the maximum fares are fixed by law. But if anybody can run an omnibus where and when he pleases, the case is quite different. The restrictions as to fares and other matters do not apply, and the omnibus becomes the libertine of the highway. Moreover, apart from the peculiar case of London, omnibuses run in competition with tramcars cannot be expected to pay, but they will have the effect of preventing the tramway from paying. Even the London General Omnibus Company would make a poor showing financially if it had not a monopoly of the west end and central districts of the metropolis where no tramways are allowed. In the discussion at the conference various members pointed out how serious would be the effect of competition. As to private interests running omnibuses in parts of towns where there are no tramways, or in extension of tramway routes, competition would to some extent probably still arise. To safeguard themselves more fully it seems quite likely that those municipalities which have not yet got powers to run omnibuses will speedily apply for Parliamentary authority to do so. That, coupled with the influential representations to be made to the Ministry, should result in a more or less satisfactory settlement.

Future of Tramways.

The conference, however, took no desponding view of the future of the tramway industry, provided that it gets fair play. The present troubles arising from high cost of labour and materials may be expected to pass away. Meantime, however, as Mr. McElroy pointed out in his useful paper on tramway developments, present costs of permanent way construction strictly limit tramway extensions. This is an additional reason for Town Councils obtaining powers to run motor omnibuses and trolley omnibuses. Where the rush hours traffic is so great that the tramway cannot cope with the whole of it, Mr. McElroy naturally urged that the local authority working the tramways should run any supplementary omnibus services necessary. The necessity for relieving tramways of the unfair burdens on them in the shape of rates and street maintenance, as compared with the comparative

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immunity of omnibuses, was dealt with both by Mr. Hamilton, and by Mr. W. Chamberlain, of Oldham, in his paper on permanent way maintenance. This is an old grievance, of course, but the passage of time makes it only the more clamant. Oldham Corporation Tramways, though minor users of the roads, are the major contributors to their cost. It is true that a case may be made out for the continued rating of tramway tracks, though on a much reduced scale, but no case whatever exists for tramway undertakings having to maintain the street surface. The arrangement—a relic of the horse-car days—is unjustifiable. Not only do the electric tramcars not wear the street surface at all, but the latter is more and more heavily punished by the constant increase in the number of heavy automobile lorries. As Mr. Chamberlain said, the cost of road maintenance is now in part spread over the actual users of the roads through the medium of excise licences, and in his opinion these licences should be extended to embrace all users of the roads.

Electricity Supply. The position in regard to electrical development under the Electricity Supply Act, 1919, remains unsatisfactory. It is true that the Electricity Commissioners, appointed under the Act, have been carrying on their work of delimiting electricity districts, holding local inquiries, issuing draft schemes, and providing for the constitution of district joint electricity authorities. Thirteen districts have been delimited, and two draft schemes await Parliamentary approval. All that kind of work is needful, and is preliminary to the development and consolidation of electricity supply. A really national scheme is, however, not to be expected, because no direct powers have been given to the joint electricity authorities to raise capital for the purchase of generating stations, the construction of others, or for general electrical development. These were provided for in the Bill of 1919 as introduced, but they were swept away along with all compulsory powers in the compromise arrived at between the Government and the House of Lords near the end of the session of that year. The Government promised to reintroduce the dropped clauses, but did not do so, contenting themselves with bringing in a small Electricity Bill last year, the main objects of which were to give the necessary financial powers to the joint electricity authorities, and to enable them to carry out schemes even though all the electrical undertakers in a district did not agree. The Bill was allowed to lapse, and the same course was followed this year on the plea that there was not time to pass it. The Government have, however, given a promise to the Electricity Commissioners that the Bill will again be introduced next year. Opposition has been threatened, evidently from a fear of the extension of bureaucracy. There would not seem to be a sound basis for that, seeing that the joint electricity authorities are to be composed of representatives of both municipalities and of private enterprise. In the meantime, whatever can be done pending the passing of the new Bill is being done. In addition to the work already mentioned, the Commissioners have sanctioned loans amounting to over fifteen million pounds for the extension and development of existing electricity undertakings. The new works are to be carried out in such a way that they will be capable of forming parts of co-ordinated schemes when these come about in their respective districts. When the joint authorities get to work, if the capital and compulsory powers are still denied to them, they will be able to carry out all their functions in every case where agreement can be reached between the parties concerned. The constituent municipalities and electric supply companies, which will have their representatives on the joint authorities, will still have their powers of raising capital, so in that indirect way the joint authorities should be able to carry out a great deal of useful work. The fact remains, however, that great advantage would arise from the passing of the Bill to which the Government are committed. In some districts it may be found that there is no need for a joint authority, as one big organisation may already be economically supplying the area, or several organisations may be voluntarily combining for the purpose.

Motor Omnibuses for Hull.—Hull Corporation recently obtained a provisional order to run motor omnibuses, and the Tramways Committee propose to apply to the Ministry of Transport for permission to borrow £10,000 for the purchase of four omnibuses. The new order only enables the Corporation to run services within the city, but the Ministry of Transport have intimated that if at a later period the Corporation formulate a definite scheme for running omnibuses outside the city a further application may be made to the Ministry.

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THE MUNICIPAL TRAMWAYS ASSOCIATION

(INCORPORATED).

20th Annual Conference held at Salford September 28th, 29th and 30th, 1921

SPECIAL REPORT.

The twentieth annual conference of the Municipal Tramways Association was held at Salford on Wednesday to Friday, September 28 to 30. From the full report given in the following pages it will be seen that the proceedings throughout were of great importance to the whole of the tramway industry in this country, and may lead to much needed legislation that will remove inequitable burdens that have checked the natural development of electric traction and, in recent years, have made profitable operation of tramways almost impossible. How imperative it is that success should be obtained in the effort which the Association is determined to make is indicated by the fact that not more than five municipal tramways were able to show a profit last year. The position, which for several years has been steadily growing more difficult, has now indeed become critical. That the facts are even yet thoroughly understood by municipalities owning tramways may be doubted, but the publicity given to the results of unfair competition should create a widespread and more accurate appreciation of the urgency of the matter. In the public interest unfair competition of road vehicles with tramways must be checked. This the Municipal Tramways Association recognises, and the strength of its determination that it shall be done was evident throughout the conference.

The arrangements for the conference were, as usual, excellently planned and carried out. There was a large attendance, the delegates numbering nearly two hundred, and representing local authorities in all parts of Great Britain and one in Ireland. The meetings were held in the fine Technical Institute in Peel Park, which is easily reached from Manchester, for the Salford Corporation cars have running powers into the neighbouring city.

On Wednesday morning the delegates were cordially welcomed by the Mayor of Salford (Alderman F. Hampson, J.P.), who alluded to the increasing influence the Association is exercising on behalf of tramway undertakings throughout the country. The tramway industry was, in his opinion, destined to be a vital link in the transport system, and he was glad to learn that the Association was working in co-operation with the Ministry of Transport in the interests of the public.

The President (Mr. G. W. Holford) thanked the Mayor for the welcome he had extended to the members and then delivered his presidential address. In opening he alluded feelingly to the recent death of Alderman H. Linsley, whom he described as "one of the most lovable men in the public life of Lancashire, for many years my chairman and for two years your president." In his address Mr. Holford thoughtfully reviewed the position of the industry "struggling against the backwash of the war," adversely affected by the general depression in trade and the steadily mounting up of costs. In spite of increased revenue, only five municipal tramways succeeded in paying their way, after meeting the obligation to provide adequately for renewals. Moreover, the increase in fares had placed the service almost beyond the reach of the poorer sections of the public. Among other points touched upon was the burden of road maintenance, wages adjustment, the work of the National Joint Council, and the cost of permanent way maintenance and rating. A specially interesting part of the address was an effective reply to a recent attack upon tramways by Lord Montagu, who described them as an anachronism. The president suggested that Lord Montagu was probably unaware that in the last session of Parliament no fewer than thirty-six local Acts were obtained relating to tramways—a number probably without precedent in the history of the industry. Those who were hostile to tramways must, he added, have some "ulterior motive for opposing this necessary, valuable, and cheap form of public transport." The address is given in full in our report and will well repay careful study. It was listened to with close attention by the conference and the president received a cordial vote of thanks.

The secretary, Mr. J. Beckett, then read a paper by Mr. J. M. McElroy on "Some Phases of Tramway Developments in the Past, and the Outlook." Mr. McElroy, to the universal regret of the delegates, was unable through illness to attend the conference, and at the end of the session a telegram of sympathy was sent, expressing appreciation of his paper and hearty good wishes for his speedy recovery. In his paper Mr. McElroy brought forward a great body of statistics to show the enormous growth of tramway traffic. Taking the year 1904 as a datum line, that being the year when most of the undertakings were fairly well established, information was given as regards the tramway systems of Glasgow, Liverpool, Leeds, Sheffield, Nottingham, Bradford, and Manchester. The figures given separately for each of these cities were grouped under the following heads—Average revenue per head of population, average fare per passenger, average journeys per head of population, average passengers per car-mile, and operation costs per car-mile. The percentage increases in these items in 1914 and 1921 as compared with 1904 were set out. The statistics generally showed that before the war there was a general tendency towards reduced fares and increased operation costs, and a gradual growth in the journeys and revenue per head. After the war started there was an accelerated growth in the journeys and revenue per head, in the passengers per car-mile and in the operation costs. The increases in the fare per passenger lagged behind until the war was practically over. The important fact emerged that the percentage increase in the average fare per passenger was a long way below the percentage increase in the operation costs. If there had been a decimal coinage system it might have been possible to have increased fares by easier stages. Turning to the future, Mr. McElroy said that the present high cost of permanent way construction would, unless materially reduced in future, put strict limits to tramway extensions, and must lead to the increased use of the motor omnibus and the trolley omnibus. He combated the idea that private enterprise should run omnibuses to supplement the tramways, and maintained that the obligations were imposed on tramways as a monopoly.

Mr. J. Dalrymple (Glasgow) opened the discussion, in which Messrs. A. Baker (Birmingham), J. B. Hamilton (Leeds), H. Mozley (Burnley), and J. Barnard (Bolton) took part. During the discussion the suggestion of Mr. H. Allcock that the existing penny should be made worth more by dividing it into ten parts instead of twelve, was mentioned by several speakers, and just before the close of the morning session the President invited Mr. Allcock to give a brief outline of his scheme. In a few words Mr. Allcock said that, as he saw it, it would be impossible to maintain for very much longer the comparatively high fares. On the one side they had the demand for the restoration of the original penny fare, but so far as one could judge the finances of the various undertakings would not permit that, because the cost of labour was higher. There was an opportunity to advocate, not a new system of coinage, but an adjustment of the existing coinage values to bring them more into harmony with present day requirements. His proposal was simply to make the existing penny coin worth more. If there could be ten coins to the shilling, each coin would have the purchasing power of 1½d., and it would produce a uniform penny fare without hurting the public.

The members and visitors were then entertained at luncheon at the Town Hall, Pendleton, by the Chairman (Alderman W. H. Barrett) and the members of the Salford Corporation Tramways Committee.

In the afternoon the discussion was resumed by Mr. W. Murray (Walthamstow), who was followed by Alderman W. Walker (Sunderland), Alderman W. C. Shipley (York), Mr. A. R. Fearnley (Sheffield), and Mr. R. H. Wilkinson (Bradford). At the conclusion of the discussion, on the motion of Mr. Hamilton, Mr. McElroy was accorded a hearty vote of thanks.

Mr. J. B. Hamilton then read his paper on "The Operation of Tramways and Omnibus Undertakings under Statutory Powers in relation to the Roads Act, 1920." In introducing his paper Mr. Hamilton said he thought the title was the principal difficulty in preparing it. They wanted to get into some compressed form the views which some of them on the Executive Council held in regard to the Roads Act, and the title of the paper was the consequence.

He discussed the financial burden on tramways in the shape of rates and road maintenance, and showed that in the case of Leeds these charges worked out at £292 per car per annum. That compared with charges of £70 or £80 per annum paid by a motor omnibus.

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THE MUNICIPAL TRAMWAYS ASSOCIATION AT SALFORD.

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Regarding tramway working expenses, he said that there were evidences of a possibility in the near future of getting back towards pre-war costs. He believed that the industry would be thoroughly reconditioned if it was not subjected to unjustified competition. With the passing of the Roads Act, 1920, however, a great danger to the successful continuance of tramway operation had arisen. He quoted a statement by an eminent Parliamentary agent on the present position, to the effect that whenever application was made for a licence for an omnibus to ply for hire, unless there were valid reasons for refusing it, the application must be granted without payment of any fee. A licensing authority would not be considered to be justified in refusing a licence merely on the ground that the running of the vehicles would set up competition with tramways or omnibuses of the local authority. It was surely, resumed Mr. Hamilton, a gross misuse of public duties which permitted a competition in passenger services by any casual person who might be the owner of a mechanically propelled vehicle. Such vehicles might be run without obligation as to fares or services. Should the licensing authority be of opinion that sufficient services are already provided, they might refuse the licence, but the applicant had the right to appeal to the Minister of Transport. Presumably the latter might say that if a road was sufficiently served the proposed services were unnecessary, and would therefore uphold the refusal. That was the crux of the whole position. Competition might go on to such an extent that it would be impossible for a statutory undertaking to continue on a self-supporting basis. Parliament had undoubtedly intended that monopolies of transport on the highways should be formed under proper conditions and obligations. Action must be taken by Parliament to prevent the menace of uneconomical competition, and this Association should make its power in Parliament felt in regard to the matter.

In the paper he brought the question to a certain point, but did not indicate a remedy. That, however, was done in a resolution that he proposed and which, in an amended form, was unanimously adopted at the conclusion of the discussion on the following day.

The resolution, as adopted, was as follows—

> "That in the opinion of the Association, representing the whole of the municipal tramways in Great Britain, the Roads Act of 1920 encourages wasteful and overlapping competition with statutory undertakings, which will inevitably result in the increased travelling charges to the public and is contrary to the intention of Parliament, and therefore representation be made at once to the Ministry of Transport urging the statutory regulation of such competition in the public interest."

In introducing his motion, Mr. Hamilton said that the Executive Council thought that the right thing to do at the present stage was to organise a campaign dealing with the matter, and if that were done he had no doubt as to what the result would be. The first step should be in the direction indicated in the resolution, that is, road services coming under the Act of 1920 should be made liable to obligations in regard to fares.

The discussion was animated and vigorous, and showed unmistakably that those responsible for municipal tramways are at length aroused to the necessity for action, and are prepared to make a strong effort to obtain some degree of justice.

On Wednesday afternoon the discussion was carried on by Messrs. H. Mozley (Burnley), Alderman C. Higham (Blackburn), Councillor R. L. Berry (Aberdare), W. Murray (Walthamstow), E. S. Rayner (Hull), and Alderman W. C. Fenton (Sheffield), all of whom strongly maintained the need in the public interest of statutory regulations governing competition with tramways.

On Thursday morning the discussion on Mr. Hamilton's paper was resumed, and the resolution as quoted above was submitted to the conference. Mr. Hamilton said that in the opinion of their legal adviser the Roads Act in its operation, if carried out literally, would be contrary to the intention of Parliament. He hoped the resolution as drawn up would carry weight not as coming from the Municipal Tramways Association, but as representing the whole country, because it was, in fact, a great deal more a question for the general travelling public than for undertakers. They were merely servants of the public, but as students of the subject they wished to draw the attention of the public to what was going to be the effect upon them. They contended that the operation of the Act would be contrary to the spirit of Parliament, that it would be wasteful, and that it would be most unfair to the public forms of transport they had to carry on.

The resolution was seconded by Mr. A. L. C. Fell, and the discussion was continued by Councillor E. Lee (St. Annes-on-the-Sea), Mr. L. C. Bellamy (St. Helens), Mr. C. Clarke (Birkenhead), Alderman E. H. Sellers (Huddersfield), Alderman R. Mayne (Newcastle-on-Tyne), Councillor I. F. Akeroyd (Bradford), Councillor A. D. Willoughby (Hull), Mr. W. T. Young (Dundee), Mr. W. Murray (Walthamstow), Councillor W. J. Squires (London), Mr. J. S. D. Moffet (Belfast), Councillor W. T. Newling (East Ham), Councillor J. Crabtree (Keighley), Mr. A. L. C. Fell (London), and Alderman J. Davis (Mayor of West Ham).

In closing the discussion, Mr. Hamilton said that the committee fully sensed the gravity of the position at the present time, not because they had any fear as to the future of tramways, but because they saw this very insiduous effort to undermine the position and to place upon the public what would in time become a serious burden. They wanted not only London, but the whole of the provinces, to bring into action such powers as they already had. Those powers were not in the resolution; they were in the things they could get their Parliamentary representatives to do. The resolution was unanimously adopted, and it was agreed that copies of the resolution be forwarded to the Prime Minister, the Minister of Transport, and to every Corporation owning and operating tramways.

The conference then adjourned for luncheon at the Manchester Town Hall at the invitation of the Chairman (Alderman J. Bowes) and the members of the Manchester City Tramways Committee.

On re-assembling in the afternoon, the conference listened to the reading of a paper by Mr. W. Chamberlain, general manager of Oldham Corporation Tramways, on "Permanent Way (Public Road) Maintenance," including notes on the equitable incidence of the cost. The conditions requiring tramway undertakings to maintain the road surface were, he said, progressively worse. He referred to the effect of heavy mechanically-propelled vehicles on the concrete foundation, and said the principle for which tramway authorities contended was recognised in the Finance Act, 1920, which imposed a graded system of excise on all mechanically-driven road vehicles, by way of an attempt to assess the burden in accordance with the measure of the user of the road. Though the tramways were the minor users of roads, they were the major contributors to their cost. The equities of the case demanded a considerable transference of the burden of road maintenance by excise licences being extended to embrace all road-users.

Owing to lack of time it was agreed that those who wished to contribute to the discussion on the paper should send their statements to the secretary, who would hand them over to Mr. Chamberlain, whose reply would be printed and issued with the other reports.

A vote of thanks was passed to Mr. Hamilton and to Mr. Chamberlain for their papers. The conference then adjourned and the annual general meeting was held, with the president in the chair. The proceedings were private, but the official account states that the report of the Executive Council was unanimously approved. The election of officers resulted in the following appointments—

PRESIDENT.

Alderman R. Mayne, J.P., Deputy Lord Mayor of Newcastle-on-Tyne, and chairman of the Newcastle Tramways Committee.

VICE-PRESIDENT.

Councillor J. Timpson, K.S.T., J.P., Mayor of Portsmouth, and chairman of Portsmouth Tramways Committee.

Hon. Treasurer—Mr. A. R. Fearnley, general manager of Sheffield Corporation Tramways.

Hon. Solicitors—Mr. S. F. James, town clerk of Ilkeston, and Mr. P. M. Heath, deputy town clerk of Manchester.

Auditor—Mr. J. W. Blakeborough, Leeds.

Members of Council—Alderman H. Clark, Mayor of Rochdale, was elected member of the Executive Council in place of Councillor J. Timpson, and Messrs. A. L. C. Fell, London County Council, J. B. Hamilton, Leeds, and R. L. Horsfield, Cardiff, retired and were re-elected.

A vote of thanks to the president was carried with acclamation, and Salford Corporation was thanked for the arrangements made in connection with the conference, to which Alderman W. H. Barrett, chairman of the Tramways Committee, suitably replied.

The annual dinner was held at the Grand Hotel, Manchester, on Thursday evening, with the president in the chair.

LIST OF MEMBERS AND DELEGATES.

Aberdare	Councillor R. L. Berry, member of committee. A. J. Abraham, general manager.
Ashton-under-Lyne ...	Alderman R. S. Oldham, chairman. Ernest Holt, general manager.
Ayr	Bailie J. Smith, convener. W. Grant, general manager.
Barrow-in-Furness ...	J. R. Groves, general manager.
Belfast	Councillor W. G. Turner, chairman. Councillor D. Anderson, vice-chairman. J. S. D. Moffet, general manager.
Birkenhead	Councillor H. Halsall, chairman. C. Clarke, general manager.
Birmingham	A. Baker, general manager. A. C. Baker, electrical engineer.
Blackburn	Alderman C. Higham, chairman. J. H. Cowell, general manager.

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LIST OF MEMBERS AND DELEGATES—(*Continued*).

Blackpool	Councillor H. Brooks, J.P., chairman. Councillor T. G. Lumb, J.P., vice-chairman. C. Furness, general manager.
Bolton	Councillor J. R. Horrocks, chairman. Councillor G. T. Higson, member of committee. J. Barnard, general manager.
Bradford	Alderman E. Priestley, J.P., chairman. Councillor I. F. Akeroyd, deputy chairman. R. H. Wilkinson, general manager. T. Stirk, traffic superintendent.
Burnley	Councillor D. D. Irving, M.P., vice-chairman. H. Mozley, general manager.
Burton-upon-Trent	A. B. Slater, general manager.
Bury	Alderman T. S. Collinge, J.P., chairman. Councillor H. Hargreaves, vice-chairman. F. Buckley, general manager.
Cardiff	R. L. Horsfield, general manager.
Chester	Alderman J. Jones, chairman. Councillor A. S. Dutton, deputy chairman. W. H. Ellis, general manager.
Chesterfield	Councillor P. M. Robinson, chairman. R. H. Campion, general manager.
Colne	Councillor J. Thompson, chairman. J. H. Thompson, general manager.
Coventry	Councillor E. O. French, J.P., chairman. Alderman M. K. Pridmore, member of committee. T. R. Whitehead, general manager.
Croydon	Councillor A. A. Thomson, chairman. Alderman G. J. Allen, J.P., vice-chairman. T. B. Goodyer, general manager.
Darwen	Councillor G. Butterworth, J.P., chairman. Councillor G. Pickup, vice-chairman. G. A. Newsome, general manager.
Dundee	Major A. Malcolm, chairman. W. T. Young, general manager.
East Ham	Alderman M. Oakes, J.P., chairman. Councillor W. T. Newling, vice-chairman. W. C. Ullmann, general manager.
Edinburgh	Councillor W. L. Sleigh, convener. R. S. Pilcher, general manager.
Exeter	Councillor F. Chick, vice-chairman. R. O. Baldwin, general manager.
Glasgow	Bailie J. M'Whirr, convener. Bailie Robt. Laing, sub-convener. J. Dalrymple, general manager.
Halifax	Alderman T. H. Hey, mayor and chairman. Ben Hall, general manager.
Haslingden	Alderman E. Russell, J.P., deputy chairman. Barnes Kay, general manager.
Huddersfield	Alderman E. H. Sellers, J.P., chairman. Councillor T. Canby, deputy chairman. A. A. Blackburn, general manager.
Hull	Councillor A. Digby Willoughby, chairman. Councillor C. P. Sherwood, vice-chairman. E. S. Rayner, general manager.
Ilford	Councillor G. R. Davey, chairman. L. E. Harvey, general manager.
Keighley	Councillor J. Crabtree, chairman. Alderman A. Smith, vice-chairman. J. A. Bromley, general manager.
Lancaster	Councillor T. Wilkinson, mayor. Councillor I. J. Curwen, chairman. J. B. Patterson, general manager.
Leeds	Alderman R. A. Smithson, chairman. Alderman H. Brown, deputy chairman. J. B. Hamilton, C.B.E., general manager. A. Daggett, traffic superintendent.
Leicester	Alderman G. Banton, vice-chairman. A. F. Lucas, general manager.
Liverpool	Councillor F. C. Wilson, chairman. P. Priestly, general manager.
London C.C.	Councillor W. J. Squires, J.P., L.C.C. chairman Highways Committee. A. L. C. Fell, C.B.E., general manager.
Lowestoft	H. H. Saunders, general manager.
Maidstone	Alderman D. T. J. Lyle, chairman. A. T. Lambert, general manager.
Manchester	Alderman Kay, J.P., Lord Mayor. Alderman J. Bowes, chairman. Alderman A. W. Chapman, deputy chairman. Councillor W. Davies, J.P., member of committee. J. T. Oakes, traffic superintendent.
Middlesbrough	Councillor E. Turner, chairman. H. G. Jeken, general manager.
Nelson	Alderman W. F. Cook, chairman. G. F. Nayler, general manager.
Newcastle-upon-Tyne	Alderman R. Mayne, J.P., chairman and Deputy Lord Mayor. E. Hatton, general manager.
Northampton	Councillor J. C. Wareing, vice-chairman. J. F. Cameron, general manager.
Nottingham	Councillor J. Clarkson, chairman. Alderman A. Turney, vice-chairman. J. Aldworth, general manager.
Oldham	Councillor J. K. Cheetham, J.P., chairman. Councillor W. H. Sharpe, member of committee. Councillor T. Wrigley, member of committee. W. Chamberlain, general manager.
Perth	W. Munro, convener. W. G. Snell, general manager.
Plymouth	H. P. Stokes, general manager.
Pontypridd	Councillor H. G. Barnes, chairman. J. E. Teasdel, general manager.
Portsmouth	Councillor J. Timpson, K.S.T., J.P., mayor and chairman. W. R. Spaven, general manager.
Preston	Alderman J. Ormrod, vice-chairman.
Rawtenstall	Councillor H. Crabtree, chairman. C. E. L. Stewart, general manager.
Reading	Alderman C. G. Field, J.P., chairman. J. M. Calder, general manager.
Rochdale	Alderman H. Clark, mayor. Alderman J. Taylor, chairman. Geo. Webster, general manager.
Rotherham	T. P. Sykes, general manager.
St. Annes-on-the-Sea	Councillor E. Lee, chairman. H. W. Laing, general manager.
St. Helens	Councillor A. Rudd, J.P., chairman. L. C. F. Bellamy, general manager.
Salford	Alderman F. Hampson, J.P., mayor. Alderman W. H. Barrett, J.P., chairman. Councillor H. Hind, deputy chairman. G. W. Holford, general manager.
Sheffield	Alderman W. C. Fenton, deputy chairman. Alderman J. Knowles, chairman, Engineering Sub-committee. A. R. Fearnley, general manager.
Southampton	Alderman F. A. Dunsford, J.P., chairman. Councillor P. V. Bowyer, member of committee. J. Dobson, general manager.
South Shields	Councillor J. G. Winskell, vice-chairman. J. C. Whiteley, general manager.
Southport	Alderman T. S. Richardson, chairman. T. J. Kendrew, general manager.
Stalybridge, Hyde, Mossley and Dukinfield Electricity and Tramways Board	Alderman R. Wood, chairman. Alderman J. E. Rhodes, J.P., deputy chairman. Frank Schofield, commercial manager. Robt. Blackmore, engineer.
Stockport	A. T. Eardley, general manager.
Sunderland	Alderman G. New, chairman. Alderman W. Walker, vice-chairman A. R. Dayson, general manager.
Tees-side Railless Traction Board	J. B. Parker, general manager.
Wallasey	Councillor H. W. Griffin, J.P., vice-chairman. Col. R. R. Greene, general manager.
Walsall	Alderman J. Cope, chairman. Alderman J. Williams, vice-chairman. C. Burgess, general manager.
Walthamstow	Councillor B. Clarkin, chairman. W. Murray, general manager.
Warrington	Alderman Sir P. Peacock, chairman. Councillor S. Gough, member of committee. J. Telfer, general manager.
West Ham	Alderman D. J. Davis, J.P., mayor. Councillor G. Croot, chairman. M. L. Slattery, general manager.
West Hartlepool	T. G. Richardson, general manager.
Wolverhampton	C. O. Silvers, general manager.
Wigan	Councillor J. Cavey, chairman. Councillor J. Walkden, vice-chairman. W. M. Milnes, general manager.
York	Alderman C. W. Shipley, vice-chairman.

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OPENING SESSION.

RECEPTION BY THE MAYOR OF SALFORD.

The twentieth annual conference of the Municipal Tramways Association (Incorporated) was held at Salford from September 28 to 30, 1921. At 10.30 on Wednesday morning, Sptember 28, the delegates were received by the Mayor of Salford (Alderman F. Hampson, J.P.) and the chairman and members of the Salford Corporation Tramways Committee, at the Technical Institute, Peel Park, Salford.

The Mayor, welcoming the delegates, said—Ladies and gentlemen,—It affords me very great pleasure to-day to extend to you a sincere and hearty welcome to the royal and ancient borough of Salford on the occasion of your twentieth annual conference. In the first place, let me say how sincerely sorry I am that we have not with us to-day the late chairman of the Tramways Committee, Mr. Alderman Linsley, who was deeply interested in the work of your Association. I must confess to only a superficial knowledge of the work of your Association, but it has been very pleasing to me to know of the increased influence it is exercising on behalf of the tramways undertakings throughout the country. I trust that its sphere of usefulness will be still further enlarged as time goes along. Your Association has, on the one hand, its own labour problems which are dealt with through the National Council. We in Salford have our labour troubles occasionally, and I was very pleased in being instrumental a few days ago in settling a dispute in connection with our own tramway undertaking which caused the entire suspension of work for a week. I hope, as the work of the Association becomes better known and better understood, that disputes of all kinds will be less frequent and easier of settlement. The tramway industry of this country, to my mind, is destined to be a vital link in the transport system. Whether in the future trams will run on rails is, perhaps, a matter of opinion; but the whole question is in a state of transition at the present time, and no doubt will emerge in a much better form ultimately. I am glad to learn that your Association is working in co-operation with the Ministry of Transport in the interest of efficiency and the well-being of the industry. In conclusion, I would like to say to the delegates present to-day that as the Mayor of this town I sincerely hope that your visit to Salford may be a happy one, and that you will all avail yourselves of the hearty welcome which the borough extends to you. I hope and trust that you will all enjoy your visit, and that the Municipal Tramways Association will derive material benefit as the result of your conference in this ancient borough.

Mr. G. W. Holford,
President of the Municipal Tramways Association, 1920-21.

Mr. G. W. Holford.—As president of the Association, I desire, on their behalf, to thank you, Mr. Mayor, most sincerely for the very hearty welcome you have given the members to Salford to-day. We who know you intimately know how sincere that welcome is, and I can assure the members here that it is sincere on behalf of the Mayor and Corporation generally. We are met here for the betterment of our tramway systems, not for the betterment of any individuals but of the industry as a whole; and I do hope that the Salford conference will be no less successful than those which have preceded it.

I thank you again, Mr. Mayor, on behalf of the members, for your very hearty welcome.

The President (Mr. G. W. Holford, general manager of Salford Corporation Tramways) then took the chair and delivered his presidential address, the full text of which follows.

PRESIDENTIAL ADDRESS.

By Mr. G. W. HOLFORD
(General Manager of Salford Corporation Tramways).

My first duty this morning is a very mournful one, for we cannot begin our proceedings without expressing the loss we all feel by the passing of one of the most lovable men in the public life of Lancashire—for many years my chairman, and for two years your president—the late Alderman Linsley. By the charm of his character, by his devotion to public interests, by his capacity for co-operating with all public men in every worthy cause, he won the esteem of all his colleagues, and we to-day deplore our loss.

I cannot express my own loss. It is thirty-five years this year since he entered the Council chamber here. Within a week of that event I entered the service of this Corporation. During more than a third of a century we have been intimately associated, and never once was our relationship marred by any shadows. You will therefore appreciate my own feelings in referring to a life-long friend.

My next duty is to associate myself with our Tramways Committee and the Mayor, in extending to you a hearty welcome upon the occasion of the third visit of the Association to Salford. In 1907 we had, by the kind permission of the Manchester Corporation, the pleasure of assisting in your entertainment upon the occasion of the holding of the Conference in the neighbouring city. In 1914 the Conference was held in the Salford Town Hall, when the late Mr. Alderman Linsley was your president, but owing to the disturbed state of affairs at that time the meeting was of a purely business character, and we could not then extend to you the hospitality we were anxious to do. The opportunity of doing so has now presented itself, and we are all very pleased indeed to see you here.

So far as I can remember, no other municipality has been honoured with so many visits of the members of the Association. We do not claim to be the Mecca towards which the industry turns for guidance, yet we believe that you will find yourselves in the midst of an unrivalled system of tramways, catering for the largest industrial community in the world, and we hope that your visit will afford you opportunities for obtaining some help in handling the growing problems which confront this great municipal public utility service.

The third year since the Armistice finds this industry—in common with every other industry—struggling against the backwash of the war. The results of operating tramways in 1920-21 have been adversely affected by the general depression in trade, and, notwithstanding the increased charges we have been compelled to make in general, the steady mounting up of costs, due to causes with which you are all familiar, has retarded, and still retards our recovery. In spite of the fact that we received a revenue of £27,101,301 last year (which was an increase of £4,044,356 over the preceding year) only five undertakings succeeded in paying their way after meeting the commercial obligation to provide adequately for renewals.

Moreover—as was shown at the recent Court of Inquiry—our increased fares have placed a system of passenger transport (which depends for its prosperity upon cheapness and the measure in which it provides for the needs of *all* sections of the community), almost beyond the reach of the poorer section of the public.

Further, we are menaced in increasing measure by other forms of road transport, which enjoy complete immunity from the exacting conditions of many kinds imposed upon us. Although we have strenuously endeavoured to alter the present state of affairs, we are,

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in fact, compelled to look on impotently, and actually to carry a heavy burden of road maintenance, arising directly from the freedom enjoyed by our competitors.

It is difficult to see how ineptitude in apportioning the growing burden of road maintenance could be better illustrated than by the position in which we find ourselves to-day. I am glad that this question is the subject of one of the papers for the Conference.

Not less important is the unfettered competition which confronts and threatens us. The railway companies now propose to come on the public roads in unmeasured weight and quantity, and this Conference will serve a great public purpose if it arouses throughout the country the cry that municipal tramways are in jeopardy by wasteful competition, if it helps to lift this great question of road transport into the prominence it merits, and sets in motion the forces of public opinion, which alone can check the obvious determination to invade our interests, and accentuate our difficulties, at the very moment when our energies are required to surmount conditions which are without precedent. This question will be submitted to your consideration by our esteemed colleague, Mr. Hamilton, and it is therefore not necessary that I should emphasise it further.

We have emerged from the biggest inquiry into the financial conditions of tramways ever made in this country (and made by direction of the Government), with an admission that we cannot bear any further financial burdens and survive. Whilst referring to this inquiry, may I say that I think we acted very wisely in confiding the conduct of our case before the Court to our own practical representatives. I can assure them, in your name, that we were entirely satisfied with the way in which they discharged a very onerous and responsible duty.

Every public authority is anxious to maintain a contented service. That is necessary in the public interest, but we have our limitations. The press of the country is constantly insisting upon the co-operation of the employees with the employers to secure and maintain industrial peace The National Council is, for us, the main instrument for that purpose, and this industry is greatly indebted to those who have so efficiently served us, at great personal sacrifice, on that body during the past year. Such a Council is fast becoming a recognised need in every industry, in order to hold the balance with an even hand, and to keep in check the natural tendency to utilise the moment of favourable conditions to secure an unfair advantage for either one side or the other, for it is in the pursuit of such a policy that recurring trouble will come, and it is to be deprecated and discouraged if peace is to be maintained.

Turning to some of the points which arise in the report of the Executive Council, it is satisfactory to find that the Ministry of Transport have not insisted upon treating tramways as identical with other road vehicles in the matter of additional lighting on tramcars, hackney carriage licences, excise licences, and in other respects. Upon these matters your representatives have interviewed the Ministry with satisfactory results.

We are, however, at variance with the Ministry upon the question of folding steps for new tramcars. Our first duty as an Association is to secure the utmost efficiency with rapidity of movement and freedom from danger of accidents. We are of opinion that folding steps will not help us in any one of these respects. I can speak from personal experience of their trial, and I know many others who can do likewise.

It will be the duty of the Conference to consider one of the foremost questions which will again, no doubt, meet us early in the New Year, namely, the employees' wages, for wages constitute the biggest item in our ordinary expenditure. There are some aspects of the wages question which, as matters of abstract principle and economic necessity, will always dominate the consideration of this subject.

The tramways industry is not a primary industry in the commercial sense. It is an industry demanded by the presence of primary industries. As it obviously follows, and does not precede industry in general, it cannot be expected to yield, as the recompense of labour, higher wages than are paid in the industries it serves. There cannot be, permanently, any section of a municipal service in which comparable labour can occupy a privileged position. We know that the total maximum war bonus to tramway employees has been 40s. over pre-war rates, in addition to a maximum of 3s. per week added to the basic rates.

The process of adjusting the bonus, definitely, to the changes in the actual cost of living has begun, and it was reduced by 3s. per week in August. Beginning with 135 per cent. as the basis, the reduction or advance follows the rate of 1s. for every five points' variation. The rate of increase—basing 40s. upon 135 per cent. represented, however, 17·77 pence for each five points. Assuming that the scheme remains in operation until the pre-war cost of living is reached—then 13s. out of the 40s. would be the balance of unreduced bonus to add to the basic rate.

There is common agreement that post-war wages will not be allowed to fall to the level of pre-war wages, but whether 13s. plus 3s.—a total of 16s.—can be added in the tramways industry to £1 12s. 8d. and £1 9s. 4d. (the pre-war general average wage of motormen and conductors respectively) is a question that probably no man can determine at the present time.

The present scheme of wages adjustment cannot, according to the recent agreement, be modified in any way until March, 1922, but it may be affirmed, as a general principle, that the wages in this industry cannot rise higher or be maintained at a higher level than those paid in more or less comparable occupations in any area; nor can the wages in the tramway industry remain at such a level as will place the employees in it in a privileged position compared with those paid for more or less analogous work in the municipal service.

These are some of the considerations which are in the minds of every municipal tramway authority when they are called upon to consider the question now before the National Council—of a general scheme of wages standardisation. The investigation into this question is in the hands of a special committee, who are devoting much attention to it, but before any definite plan is adopted, each authority within the area of each District Council will, I understand, have an opportunity of considering it.

The relation of tramways to other forms of passenger road transport is exercising the minds of the tramway world. The cost of permanent way renewal or reconstruction presses and stresses the problem. The alternative method of trolley omnibuses upon routes where traffic is not heavy is now being seriously considered. These omnibuses pay an excise licence upon their seating capacity, and the operators escape any obligations for the cost of road maintenance and renewal. They also escape rating, so far as the roads—the common permanent way—are concerned. There are factors, however, which must be brought into purview and kept in mind. The maintenance of roads will still be necessary. If the obligation no longer falls upon the travelling public in the shape of fares charged for rides, it will reach them through the channels of the necessary evils of rates and taxes to the extent that such cost is not covered—as it does not pretend to be—by the excise licence. This in turn raises the question of the payment of the whole of the cost of maintenance of roads by all the users of the roads, and if that principle were once again laid down, the excise licence would have to be raised to an amount sufficient to cover such cost.

Similarly, other rateable property will bear the local rates now thrown upon tramways. These charges will not cease to exist upon somebody. Clearly they will be merely transferred—not abolished. Of course, such considerations will be swept aside in the wider view, or rather the purely commercial aspect of competing forms of road passenger transport, upon which the community will base the ultimate test.

Lord Montagu said in his recent articles on "Roads," which appeared in the *Times*—

> "Of course, tramways on main roads are an anachronism, and these light railways, for they are nothing else, should purchase wherever possible, as other light railways do, their own land for premanent way, or else, where there is room, put their tracks on the edge of the main roads, leaving the road surface undisturbed.
>
> "Some comfort may be derived from the fact that in the present bad financial state of tramways generally, no extension of their tracks on the roads is likely to take place, and any extension should certainly be opposed by county and other road authorities."

It is quite evident that neither municipal tramway undertakings nor company-owned undertakings have a friend in his lordship. He apparently does not realise that municipal tramway undertakings are essentially public utility services; that they are there to meet the requirements of vast populations of working people who have to be carried to and from their places of employment, and that without such transport facilities these people would suffer great hardship. Nor does he seem to realise that they have been the means of encouraging a large percentage of the population to leave the congested portions of towns and cities, in order to reside in the suburbs, where the environment is of a much more healthy and pleasant character. Tramways are, in fact (and we thought everybody knew it to be a fact), necessary for our modern industrial conditions. They cannot be thought of in terms of village life and country roads, with a single little rail "on the edge of the road" and a single deck car leisurely picking up passengers, with a half-hourly service.

Lord Montagu fails to offer an alternative system of transport. He probably has in mind the utilisation of motor omnibuses. He is probably not aware that tramway undertakings have to bear the cost of the maintenance of that portion of the roadway upon which the tramways are laid, and that all other forms of traffic utilise the same without paying toll to the tramway authority towards the cost of maintenance (a matter to which I have previously

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referred), and although road authorities are relieved of the expense of maintaining such portions of the roads, he recommends them to oppose any further extensions of tramways.

It may be information to him to learn that during the last Parliamentary session no fewer than thirty-six Local Acts were obtained relating to tramways—a number probably without precedent in the history of our industry, and let it be observed, the promoters, being the local authorities in most cases, were, in fact, the road authorities. His apparent objection to the existence of tramway undertakings is very belated, and I think he will find that he has very few friends of the same opinion, unless indeed they have some ulterior motive for opposing this necessary and valuable and cheap form of public transport.

Permit me to mention that this Association includes within its membership practically the whole of the municipally owned and operated tramway undertakings. The extent of their importance will be realised when I state that there are 102 such undertakings in the country. They represent a capital of £57,993,898. During the past year they carried over 3,632 million passengers, and the track operated upon measures 1,705 miles.

During the last twenty years our Association has played a very useful and effective part in the tramway world. The problems before it loom larger than any hitherto dealt with. To the task of solving them the Association can bring to bear the fruits of a long experience and ripe judgment, so that we can enter upon another year of strenuous labour in our common interests, confident that with the same measure of patience and good-will which served to help us through the world crisis of 1914-18, we may reach, during the first full year after the official termination of the war, much smoother conditions, and settle down to the urgent and supremely important task of restoring this great industry to something resembling its pre-war prosperity.

In conclusion, I desire to thank my colleagues on the Executive Council for the loyalty and help which they have extended to me during my term of office. I hardly like to mention individuals. It is sometimes invidious. I cannot refrain, however, from reference to the services of our worthy vice-president, Alderman Mayne; to Mr. Alderman Higham, who has never missed a meeting of the Executive Council, and whose help, not only with us, but on the Industrial Council, has been of so valuable a character; and to Messrs. Hamilton, Fell, Fearnley, and McElroy, who have always been ready to take up any extra burdens we have imposed upon them, at least as far as their health permitted. Last, but not least, to our able general secretary, who has given unsparingly of his time and energy to the important matters which have engaged our attention during the past twelve months.

To this Association, which attains its majority next year, and whose interests I have endeavoured to serve for some years, I wish for the future a greater measure of success, if that be possible, than has been achieved in the past.

Alderman E. H. Sellers, J.P. (chairman, Huddersfield Corporation Tramways Committee).—I have pleasure in moving our thanks to the president for his admirable address. It will go without any saying on my part how much you all, I am sure, appreciate it, and I am very glad we already have it in print, so that we can look over it at our leisure. I have very much pleasure in proposing that a vote of thanks be accorded the president for his address.

Councillor J. Timpson, J.P. (Mayor of Portsmouth and chairman of the Tramways Committee).—I have much pleasure in seconding that resolution. So far as my memory carries me, I do not know that I have ever heard a more interesting address by any president of this Association. I have very much pleasure in seconding the resolution.

The resolution was carried amid applause.

The President.—Thank you, gentlemen. The next item on the agenda is a reference to a little booklet that has been issued giving details of our own tramways undertaking. It is of a somewhat interesting character, and I hope you will not leave the borough without taking one of these little booklets with you.

The General Secretary (Mr. J. Beckett).—A number of people who have been invited have expressed their regret at being unable to be present to-day. Sir Eric Geddes regrets that appointments elsewhere prevent him from being present at the conference. The Hon. Sir Arthur Stanley is also unable to come. Sir John Courtis sends greetings, and is sorry that appointments prevent him coming. Alderman Wylie is absent through his wife's ill-health. Alderman Flint regrets he is unable to come, and also Alderman Craddock, of Wolverhampton. Mr. Tegetmeier, the chairman, Mr. Howley, the vice-chairman, and Mr. de Turckheim, the secretary of the Tramways and Light Railways Association, also regret they cannot be present. As to honorary members, Mr. C. J. Spencer sends greetings and cannot come; Mr. Peter Fisher also desires to be remembered to the conference. Mr. H. E. Blain sends his compliments, and is sorry he cannot come; so also have the Mayor of Chester and the Sheriff of Chester. Then Mr. E. H. Edwardes, general manager of the South Lancashire Tramways Company, owing to whose beneficence we shall be able to travel to Chester free on Friday, regrets that he cannot be present. One of our honorary solicitors is also absent. There are also several messages from members of the Manchester and Salford Tramways Committees expressing regret. There is also the unfortunate absence of our esteemed friend, Mr. J. M. McElroy. I spoke to him yesterday morning on the telephone when I arrived in Manchester, and I was informed that the doctor had prohibited him from coming to the conference. He said that if Mr. McElroy used his foot for two or three days in order to get to the conference it would mean a month on one side. That was not debatable, and I am sure you will, later on, wish to send some message of sympathy to our esteemed colleague, Mr. McElroy. In his absence therefore I have to read his paper.

SOME PHASES OF TRAMWAY DEVELOPMENTS IN THE PAST, AND THE OUTLOOK.

By J. M. McELROY

(*General Manager, Manchester Corporation Tramways*).

That the utility—the carrying capacity—of urban roads for passenger transport has been greatly increased during the past few decades by the laying down of rails for tramways, is a proposition the truth of which few will deny, although there are some who do not go all the way with tramway people in advocating this form of passenger transport, especially having in mind recent developments in other forms of road transport.

Passing through its stages of evolution—horse, steam, and electric—there is every evidence, speaking broadly, that the tramway has not merely met the constantly growing traffic demands, but has, by the facilities it has provided, greatly stimulated that growth. The growth continues at a great rate. There may be temporary fluctuations due to bad trade or other causes, but the curve is an upward one nearly all the time.

Attempts have been made from time to time to show that the rate of growth may be reduced to a formula, e.g., that it increases as the square of the population, but the actual evidence has upset all formulas. It has left them all behind.

This rapid growth brings with it many fresh problems for those engaged in the passenger transport business—problems which the war and its resultant great changes in values have made much more difficult of solution.

With the object of studying certain phases of some of the problems we have been (and are still) confronted with, I have obtained certain statistics from the tramway managers in the undermentioned cities—

Glasgow.	Leeds.	Nottingham.
Liverpool.	Sheffield.	Bradford.

to which I have added the Manchester statistics.

Taking the year 1904 as a datum line—that being the year when most of the undertakings were fairly well established—the information shows the developments and changes each year since 1904 under the following heads—

Average revenue per head of population.
,, fare per passenger.
,, journeys per head of population.
,, passengers carried per car-mile.
Operation costs per car-mile.

The statements in the appendix give the information in detail and will repay careful study.

I have purposely left out a factor which some may think might, with advantage, have been put in, namely, the financial results. My reason for excluding these was that their inclusion would have complicated the figures, particularly as the question of the proper figures for renewals and depreciation would have had to be gone into.

The accompanying charts show, in graphic form, the percentage increases and decreases, and they clearly indicate the great changes brought about by the war.

The following general observations are submitted—

GLASGOW.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger ...	15 per cent. decrease	40 per cent. increase
Revenue per head ...	30 per cent. increase	147 ,, ,,
Operation costs ...	34 ,, ,,	210 ,, ,,
Journeys per head ...	55 ,, ,,	76 ,, ,,
Passengers per car-mile	19 ,, ,,	43 ,, ,,

Looking at the Glasgow graph it will be observed that the average fare per passenger rose very slightly from 1904 to 1911, but after

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that it fell considerably and remained at its very low figure throughout the war and up to the year 1920.

The journeys and revenue per head showed a marked rise right from the time the fares were lowered in 1911, and it continued until the year 1919. This, added to the greater number of passengers carried per car-mile, up to a certain point, evidently met the continued increase in operation costs. But the latter in 1917 began to mount up at a great rate, quite out-running the other factors, but it was not till 1920 that the inevitable increase in fares took place.

LIVERPOOL.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger	1·8 per cent. increase	39 per cent. increase
Revenue per head	23 ,, ,,	152 ,, ,,
Operation costs	14 ,, ,,	206 ,, ,,
Journeys per head	16 ,, ,,	72 ,, ,,
Passengers per car-mile	22 ,, ,,	66 ,, ,,

The Liverpool accounts and statistics are made up to the end of December in each year, and therefore the latest figures are for the year ended December, 1920. The fare per passenger remained practically level to the year 1917, although the operating costs at that year showed a 50 per cent. increase. The revenue per head in that year showed a 44 per cent. increase, the journeys per head a 35 per cent. increase, also the passengers per car-mile showed a 44 per cent. increase. These factors no doubt helped the undertaking to meet the growing costs. From 1917 the fare per passenger

Mr. J. M. McElroy,
General Manager, Manchester Corporation Tramways.

grew slightly to the year 1918, and from then, in common with other undertakings, there was a rapid growth to meet the mounting costs.

LEEDS.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger	2 per cent. decrease	54 per cent. increase
Revenue per head	31 per cent. increase	177 ,, ,,
Operation costs	13 ,, ,,	209 ,, ,,
Journeys per head	33 ,, ,,	82 ,, ,,
Passengers per car-mile	2 ,, ,,	36 ,, ,,

From 1904 right to the year 1918 the average fare in Leeds kept fairly level. During that period the revenue and journeys per head increased practically every year. In 1918, when the move in fares began, the revenue per head had increased 74 per cent. This, added to the fact that there was a considerable increase in the number of passengers per car-mile, no doubt helped the undertaking up to that date to keep pace with the rising costs of operation between 1915 and 1918. From 1918 the fares were increased in the endeavour to keep pace with the great growth in operation costs. The journeys per head of population fell slightly for a year, but this did not affect the growth of revenue per head.

SHEFFIELD.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger	3 per cent. decrease	66 per cent. increase
Revenue per head	47 per cent. increase	272 ,, ,,
Operating costs	3 ,, ,,	176 ,, ,,
Journeys per head	51 ,, ,,	122 ,, ,,
Passengers per car-mile	10 ,, ,,	35 ,, ,,

From the year 1904 to 1912 the fare per passenger kept practically constant, a slight fall being maintained until the year 1917, after which gradually increases in the fares brought about an increase of 66 per cent. in the year 1921. The passengers carried per car-mile showed a decline after the year 1908, but increases took place from the year 1910, which, together with the increase in fares referred to, caused a large increase in the revenue per head of population, which in the year 1921 showed an increase of 272 per cent. The increase in the operation costs in 1921 was 176 per cent.

NOTTINGHAM.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger	5·6 per cent. decrease	42 per cent. increase
Revenue per head	31 per cent. increase	182 ,, ,,
Operating costs	6 ,, ,,	182 ,, ,,
Journeys per head	34 ,, ,,	91 ,, ,,
Passengers per car-mile	2·7 ,, ,,	29 ,, ,,

There were decreases in the fare per passenger almost to the year 1918. Up to that period there was a growth of revenue and journeys per head, and the passengers per car-mile also grew considerably between 1913 and 1918. From 1918 to 1919 there was a rapid rise in fares and a fall in journeys per head and passengers per car-mile, but a considerable growth in the revenue per head. From 1919 to 1921 the costs increased rapidly, and so did the revenue. The fare during this period showed no increase, but the journeys per head, and the passengers per car-mile each showed a rise after the fall during the previous year.

BRADFORD.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger	9 per cent. decrease	57 per cent. increase
Revenue per head	34 per cent. increase	203 ,, ,,
Operation costs	15 ,, ,,	222 ,, ,,
Journeys per head	49 ,, ,,	96 ,, ,,
Passengers per car-mile	24 ,, ,,	60 ,, ,,

From 1904 to the year 1912 the fare per passenger kept almost level, and so did the operation costs. There was, however, during this period, a 21 per cent. increase in the revenue per head. From 1912 to 1918 there was a considerable drop in the fare per passenger, and although the operation costs increased considerably during that period, the revenue per head, the journeys per head, and the passengers per car-mile grew considerably. From 1918 the fare per passenger took an upward course to meet the great increase in operation costs. The journeys per head fell temporarily, but recovered after the first year. The revenue per head, however, increased in parallel with the rising costs.

MANCHESTER.

	At 1914 compared with 1904.	At 1921 compared with 1904.
Fare per passenger	12 per cent. decrease	32 per cent. increase
Revenue per head	31 per cent. increase	141 ,, ,,
Operation costs	6 ,, ,,	185 ,, ,,
Journeys per head	35 ,, ,,	73 ,, ,,
Passengers per car-mile	22 ,, ,,	63 ,, ,,

The Manchester growth shows a gradual decrease in the average fare up to the year 1914, and from that year it kept level to the year 1917.

The revenue per head steadily grew from 1904 to 1914, thus showing the soundness of the policy of the gradual introduction of cheaper fares. From 1914 to 1917 the revenue per head kept fairly level, but the operation costs increased rapidly. Between these years, however, the passengers per car-mile were increasing, and this factor, to some extent, neutralised the effect of the increasing operation costs. From 1917—in common with other undertakings—the operation costs started their big climb which could only be met by an increase in fares, and in 1921 it will be seen that the operation costs had increased 185 per cent., and the average fare per passenger 31 per cent.

What are the general conclusions to be drawn from these statistics? They show that before the war there was—

(1) A general tendency towards reduced fares.
(2) A general tendency towards increased operation costs.
(3) A gradual growth in the journeys and revenue per head.

All these factors illustrate the soundness of the policy of cheap fares which resulted in increased travel and greater revenue, which more than met the increasing operation costs.

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After the war started there was, almost from the start, an accelerated growth—

(1) In the journeys and revenue per head.
(2) In the passengers per car-mile.
(3) In the operation costs.

The increases in the fare per passenger lagged behind until the war was practically over. It was not till about the years 1918 and 1919 that the large increases took place—increases which the tremendous growth in the operation costs in these years absolutely demanded.

One important fact emerges, namely, that the percentage increase in the average fare per passenger in all the cities is a long way below the percentage increase in the operation costs. With that at the moment we must be content and await the time when with reduced costs we may again introduce lower fares.

The urban passenger transport business is built up round coins. It is a small-coin cash business, and the unit in the past (with a few notable exceptions) was the penny fare. In most other businesses it has not been a difficult matter to pass on in easy stages to the consumer the increased costs of production. In our business it has not been possible easily to do this. If we had had a decimal coinage system, such as has been recently advocated with considerable force, it might have been possible to have increased our fares by easier stages than we have done, and correspondingly it would be easier to reduce the fares when the time is ripe for this to be done.

The methods adopted by the municipalities in increasing fares have not been uniform. At the present time there are 45 municipal undertakings charging a minimum penny fare, and the average distance which can be travelled for this fare varies in the different undertakings from 1¼ miles to 696 yards. Some of these undertakings still carry workpeople at cheaper rates. There are 34 undertakings which charge a minimum fare of 1½d., the distance which passengers can travel at this fare varying from 1 mile 1,130 yards to 987 yards. Eleven undertakings have a minimum fare of 2d., and the distances which can be travelled at this fare vary from 3 miles to 1 mile 140 yards.

Sufficient time has not elapsed to enable us to draw any general conclusions as to which is the soundest policy. Some believe that the wisest policy is to charge a high initial fare and a comparatively low long-distance fare, thus tending to induce the spread of the population over a wider area. Others think it is unwise to increase the minimum penny fare, especially as the next higher fare, which the coinage permits, namely, 1½d., involves the use of two coins, and further it is feared that a minimum charge of 1½d. might tend to stop a lot of short distance travelling.

Those who plumped for a minimum 2d. fare have taken some risks of lessening the riding habit. It will be interesting to note the effect of all these changes when sufficient time has elapsed to enable us to draw conclusions.

Now, what of the future?

The present high cost of permanent way construction will, unless it is materially reduced in the future, put strict limits to tramway extensions, and must necessarily lead to the increased use of the motor omnibus and the trolley omnibus, and in many instances where tramway tracks require reconstructing, the question as to whether motor or trolley omnibuses should be substituted for tramways, is a question which must of necessity in many instances be considered. No conclusion of general application can be made in connection with this. Local study of the problems presented is necessary.

As regards the traffic problems confronting some of our larger cities, we hear many views expressed as to how these should be dealt with. Some of these views are worthy of consideration, but many views are expressed by well-meaning people—quite inexperienced in transport problems—who think they know how "to do things." There is no shortage of teamway managers in every city.

If I were to say that the passenger transport business in a city or town should be regarded as a monopoly run or controlled by the local authority in the public interests, I imagine I should at once raise an outcry against any such proposal. The very word monopoly rouses opposition, and it is claimed that competition is bound to be beneficial. But is it? Let us look at the matter quite frankly.

It is clearly a city's duty to see that its citizens are provided with suitable and adequate means of passenger transport at all times and in all directions, just as it provides other public services necessary for the public health and welfare. Its greatest task is to make full provision for the great tide of passenger traffic into the city centre in the mornings and out to the suburbs in the evenings—the peak loads. It has to decide how best to do this. A solution of this at one period will not, of course, stand for all time. The problem is a changing one, and the position has to be reviewed from time to time—say from decade to decade.

It is admitted by all those who are qualified to judge that the modern tramcar is the most efficient vehicle for handling heavy peak load traffic up to a certain traffic density. When the traffic passes beyond that density it has ultimately to be carried underground.

The provision of a tramcar service of adequate capacity to meet the peak loads involves the provision of a large amount of plant which is used for a few hours only each day. It calls for a large number of "part-day" cars which are in service during the rush hours only. These have to be housed and maintained, and adequate power plant has to be provided at the generating stations.

Appended to this report is a diagram showing the heavy peak on a typical route in Manchester. The diagram also indicates the growth of traffic since the year 1913.

In Manchester we double the service of cars to meet these peaks, and the "part-day" cars we put into service at the rush hours are only on the roads for a comparatively short time each day—less than one-third the time the "all-day" cars are in service, and some cars at the morning "rush" are run for a few journeys only—a costly business for any undertaking.

When the tramways on arterial routes, near the city centres, reach their "saturation" point at the hours of peak load, and are still incapable of satisfactorily coping with the traffic, then (*a*) parallel tramway routes must, if possible, be provided; (*b*) motor omnibuses must be run to supplement the trams, or (*c*) underground railways must be provided.

The running of motor omnibuses to supplement the trams at the peak would introduce considerable difficulties by adding to the street congestion unless the streets are exceptionally wide—a state of things which is not common in our cities. The other road users—commercial vehicle users—at present accuse tramway operators with monopolising the middle half of the roadway. What would they say if we were to attempt to monopolise a large part of the sides of the roads with motor omnibuses?

It has been suggested that private enterprise should be allowed to come in and run motor omnibuses to supplement the tramways to help with the peak load difficulties.

It has even been suggested that the tramcars, which are admittedly the best peak load vehicle, should be restricted to carrying the peak loads supplemented by motor omnibuses, and that during the slack hours of the day, motor omnibuses alone should be run, they being well able to deal with this traffic.

This proposition has only to be stated to show its absurdity.

The provision and operation of tramways to meet the peak at reasonably low fares can only be done if the undertaking is carried on as a business concern, and the plant, etc., provided is run as nearly as possible at its maximum efficiency.

A tramway undertaking operated by a municipality has not only the obligations imposed upon it by Parliament, namely, (1) that it must maintain the paving between the rails and 18 inches outside them; (2) that it must pay the local rates in respect of the rails laid in the streets, but the municipality has a tacit obligation to run cars at all times and in practically all directions, to run night services as well as day services, to run services along "thin" routes as well as good paying routes, to run costly "part-day" cars at the "peaks" for a few journeys only. In short, to meet all the legitimate demands of the public for passenger transport at such reasonably low fares as enable practically every citizen to use the facilities provided.

But that is not all. In many cities and towns the tramway undertakings are called upon to pay large sums towards street improvements, and the provision of new streets, etc. In Manchester the making of several costly new arterial roads in the central parts of the city has been sanctioned by Parliament, and half of the expense of this work will be borne by the tramways undertaking.

All these obligations are imposed legally or impliedly as conditions attaching to a public service which is or should be regarded as a monopoly.

What then is to be said for private enterprise coming in to compete with passenger transport facilities in these circumstances?

If it is to be allowed to come in and run unrestrictedly without obligations such as those imposed upon tramways, then it will follow that the services and advantages which the tramways have been able to give to the citizens will tend to diminish, because however effective the tramways have been in meeting the requirements of a city, they may not be able to give all the advantages they have done in the past if they have to compete with a rival system which is free from all the onerous obligations placed upon the tramways.

In the past tramways have successfully catered for, and fully met, the demands of the travelling public in all our cities except London, where the conditions are exceptional and totally unlike those of any other city.

The title of my paper impliedly suggests that I might say something about the coming big development of passenger transport by road vehicles, the establishment of large numbers of inter-urban services, and the attitude which municipalities should take in the matter, but this phase of the developments of urban, suburban, and inter-urban passenger transport will be fully and ably dealt with in Mr. Hamilton's paper.

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TABLES APPENDED TO MR. McELROY'S PAPER.

GLASGOW.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	·72	—	—	·91	—	—	189			11·6			5·66		
1905	·76	5·6	—	·93	2·2	—	196	3·7	—	10·9	—	6·0	6·22	9·9	—
1906	·77	6·9	—	·94	3·3	—	198	4·8	—	11·0	—	5·2	6·82	20·5	—
1907	·85	18·1	—	·95	4·4	—	213	12·7	—	11·0	—	5·2	6·76	19·4	—
1908	·86	19·4	—	·96	5·5	—	216	14·3	—	10·9	—	6·0	6·96	23·0	—
1909	·85	18·1	—	·96	5·5	—	212	12·2	—	10·7	—	7·8	6·96	23·0	—
1910	·85	18·1	—	·96	5·5	—	212	12·2	—	10·6	—	8·6	6·92	22·3	—
1911	·82	13·9	—	·95	4·4	—	207	9·5	—	11·0	—	5·2	7·03	24·2	—
1912	·86	19·4	—	·86	—	5·5	240	27·0	—	12·3	6·0	—	7·33	29·5	—
1913	·87	20·8	—	·78	—	14·3	271	43·4	—	13·3	14·7	—	7·45	31·6	—
1914	·94	30·6	—	·77	—	15·4	293	55·0	—	13·8	19·0	—	7·63	34·8	—
1915	·93	29·2	—	·76	—	16·5	292	54·5	—	13·9	19·8	—	8·14	43·8	—
1916	1·0	38·9	—	·76	—	16·5	315	66·7	—	14·5	25·0	—	8·29	46·5	—
1917	1·08	50·0	—	·77	—	15·4	338	78·8	—	15·1	30·2	—	8·04	42·0	—
1918	1·22	69·4	—	·78	—	14·3	375	98·4	—	16·4	41·4	—	9·77	72·6	—
1919	1·33	84·7	—	·79	—	13·2	404	113·8	—	18·1	56·0	—	11·92	110·6	—
1920	1·28	77·8	—	·81	—	11·0	380	101·1	—	19·3	66·4	—	14·4	154·4	—
1921	1·78	147·2	—	1·28	40·7	—	334	76·7	—	16·6	43·1	—	17·58	210·6	—

LIVERPOOL.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	·72			1·11			163	—		9			7·26	—	
1905	—	—	—	1·11	—	—	165	1·2	—	9	—	—	7·59	4·5	—
1906	—	—	—	1·11	—	—	168	3·1	—	10	11·1	—	7·75	6·7	—
1907	—	—	—	1·11	—	—	170	4·3	—	10	11·1	—	7·94	9·4	—
1908	—	—	—	1·11	—	—	165	1·8	—	10	11·1	—	7·98	9·9	—
1909	—	—	—	1·11	—	—	165	1·2	—	10	11·1	—	8·04	10·7	—
1910	—	—	—	1·11	—	—	169	3·7	—	10	11·1	—	7·96	9·6	—
1911	—	—	—	1·12	·9	—	172	5·5	—	10	11·1	—	7·95	9·5	—
1912	—	—	—	1·13	1·8	—	178	9·2	—	11	22·2	—	8·10	11·6	—
1913	·83	15·3	—	1·13	1·8	—	190	16·6	—	11	22·2	—	8·06	11·0	—
1914	·89	23·6	—	1·13	1·8	—	189	16·0	—	11	22·2	—	8·32	14·6	—
1915	·90	25·0	—	1·13	1·8	—	195	19·6	—	12	33·3	—	9·24	27·3	—
1916	·95	31·9	—	1·12	·9	—	202	23·9	—	12	33·3	—	9·8	35·0	—
1917	1·04	44·5	—	1·14	2·7	—	221	35·6	—	13	44·4	—	10·88	49·9	—
1918	1·23	70·8	—	1·18	6·3	—	249	52·8	—	16	77·8	—	14·08	93·9	—
1919	1·5	108·2	—	1·36	22·5	—	266	63·2	—	16	77·8	—	18·74	158·1	—
1920	1·82	152·7	—	1·55	39·7	—	281	72·4	—	15	66·7	—	22·24	206·3	—

LEEDS.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	·62	—	—	1·10	—	—	136	—		10·0	—	—	5·86	—	—
1905	·65	4·8	—	1·10	—	—	142	4·8	—	9·1	—	9·0	6·18	5·5	—
1906	·67	8·1	—	1·06	—	3·6	152	12·7	—	9·8	—	2·0	5·99	2·2	—
1907	·70	12·9	—	1·07	—	2·7	158	17·5	—	9·9	—	1·0	6·3	7·5	—
1908	·71	14·5	—	1·07	—	2·7	161	19·8	—	9·7	—	3·0	6·19	5·6	—
1909	·71	14·5	—	1·06	—	3·6	160	19·1	—	9·7	—	3·0	6·12	4·4	—
1910	·73	17·7	—	1·08	—	1·8	162	20·6	—	9·6	—	4·0	6·08	3·8	—
1911	·74	19·4	—	1·08	—	1·8	162	20·6	—	9·7	—	3·0	6·45	10·1	—
1912	·78	25·8	—	1·09	—	·9	172	28·6	—	10·1	1·0	—	6·35	8·4	—
1913	·82	32·3	—	1·09	—	·9	171	27·8	—	10·2	2·0	—	6·58	12·3	—
1914	·81	30·6	—	1·08	—	1·8	178	33·3	—	10·2	2·0	—	6·63	13·1	—
1915	·82	32·3	—	1·08	—	1·8	182	36·5	—	10·0	—	—	6·48	10·6	—
1916	·87	40·4	—	1·08	—	1·8	191	43·6	—	11·0	10·0	—	6·86	17·1	—
1917	·95	53·2	—	1·09	—	·9	207	56·4	—	11·6	16·0	—	7·12	21·5	—
1918	1·08	74·2	—	1·11	·9	—	230	74·6	—	13·0	30·0	—	8·73	49·0	—
1919	1·33	114·5	—	1·42	29·1	—	222	68·3	—	13·1	31·0	—	11·92	103·4	—
1920	1·51	143·5	—	1·52	38·2	—	235	78·6	—	13·8	38·0	—	15·63	166·7	—
1921	1·72	177·4	—	1·70	54·5	—	239	81·8	—	13·6	36·0	—	18·16	209·9	—

SHEFFIELD.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	·55	—	—	·91	—	—	145	—	—	10·7	—	—	6·51	—	—
1905	·57	3·6	—	·90	—	1·1	148	2·7	—	10·6	—	·9	6·48	—	·46
1906	·60	9·1	—	·90	—	1·1	155	6·9	—	10·9	1·9	—	6·56	·77	—
1907	·64	16·4	—	·90	—	1·1	165	13·8	—	10·9	1·9	—	6·39	—	1·84
1908	·66	20·0	—	·90	—	1·1	170	17·3	—	11·0	2·8	—	6·51	—	—
1909	·65	18·2	—	·90	—	1·1	165	13·8	—	10·4	—	2·8	6·33	—	2·76
1910	·66	20·0	—	·90	—	1·1	167	15·2	—	10·5	—	1·9	6·33	—	2·76
1911	·70	27·3	—	·90	—	1·1	176	21·3	—	11·1	3·7	—	6·34	—	2·61
1912	·74	34·6	—	·90	—	1·1	198	36·5	—	11·7	9·4	—	6·61	1·54	—
1913	·77	40·0	—	·89	—	2·2	207	42·7	—	11·9	11·2	—	6·65	2·15	—
1914	·81	47·3	—	·88	—	3·3	219	51·0	—	11·8	10·3	—	6·73	3·38	—
1915	·81	47·3	—	·88	—	3·3	220	51·7	—	12·1	13·1	—	6·57	·92	—
1916	·94	70·9	—	·88	—	3·3	264	82·0	—	13·9	29·9	—	7·33	12·60	—
1917	1·11	101·8	—	·88	—	3·3	301	107·5	—	14·8	38·3	—	8·34	28·1	—
1918	1·26	129·1	—	·93	2·2	—	322	122·0	—	15·7	46·8	—	10·17	56·2	—
1919	1·4	154·5	—	·96	5·5	—	346	138·5	—	17·3	31·7	—	12·39	90·3	—
1920	1·71	210·9	—	1·31	44·0	—	310	113·8	—	14·8	38·3	—	15·84	143·3	—
1921	2·05	272·7	—	1·51	66·1	—	322	122·0	—	14·5	35·5	—	17·98	176·2	—

NOTTINGHAM.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	·51	—	—	1·08	—	—	116	—	—	11·1	—	—	6·74	—	—
1905	·50	—	2·0	1·08	—	—	115	—	·9	10·8	—	2·7	6·91	2·5	—
1906	·51	—	—	1·06	—	1·9	120	3·5	—	11·0	—	·9	6·95	3·1	—
1907	·55	7·8	—	1·06	—	1·9	125	7·8	—	11·4	2·7	—	7·11	5·5	—
1908	·60	17·7	—	1·05	—	2·8	138	19·0	—	10·4	—	6·3	6·98	3·6	—
1909	·58	13·7	—	1·05	—	2·8	135	16·4	—	10·2	—	8·1	7·10	5·3	—
1910	·59	15·7	—	1·05	—	2·8	138	19·0	—	10·4	—	6·3	6·91	2·5	—
1911	·60	17·7	—	1·05	—	2·8	136	17·2	—	10·4	—	6·3	7·21	7·0	—
1912	·61	19·6	—	1·06	—	1·9	138	19·0	—	10·4	—	6·3	7·16	6·2	—
1913	·62	21·6	—	1·02	—	5·6	148	27·8	—	11·0	—	·9	7·29	8·2	—
1914	·67	31·4	—	1·02	—	5·6	156	34·5	—	11·4	2·7	—	7·17	6·4	—
1915	·69	35·3	—	1·02	—	5·6	158	36·2	—	10·9	—	1·8	6·98	3·6	—
1916	·72	41·2	—	1·01	—	6·5	169	45·7	—	11·8	6·3	—	7·27	7·9	—
1917	·75	47·1	—	1·02	—	5·6	175	50·8	—	12·6	13·5	—	8·07	19·7	—
1918	·88	72·5	—	1·07	—	·9	195	68·2	—	13·9	25·2	—	9·25	37·2	—
1919	1·10	115·7	—	1·57	45·4	—	166	43·1	—	13·0	17·1	—	13·01	93·0	—
1920	1·35	164·7	—	1·53	41·6	—	210	81·1	—	14·4	29·7	—	16·29	141·7	—
1921	1·44	182·4	—	1·54	42·6	—	222	91·4	—	14·4	29·7	—	19·04	182·5	—

BRADFORD.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	—	—	—	1·17	—	—	122	—	—	8·7	—	—	7·28	—	—
1905	—	—	—	1·17	—	—	145	18·9	—	9·3	6·9	—	7·54	3·6	—
1906	·64	—	—	1·17	—	—	139	13·9	—	9·0	3·4	—	7·36	1·1	—
1907	·66	3·1	—	1·17	—	—	144	18·0	—	9·0	3·4	—	7·4	1·6	—
1908	·67	4·7	—	1·16	—	·9	141	15·6	—	9·0	3·4	—	7·26	—	·3
1909	·66	3·1	—	1·17	—	—	141	15·6	—	8·9	2·3	—	7·22	—	·8
1910	·70	9·4	—	1·17	—	—	149	22·1	—	9·3	6·9	—	7·15	—	1·8
1911	·73	14·1	—	1·16	—	·9	157	28·7	—	9·7	11·5	—	7·33	·7	—
1912	·78	21·9	—	1·17	—	—	167	36·9	—	9·9	13·8	—	7·19	—	1·2
1913	·79	23·4	—	1·09	—	6·8	175	43·5	—	10·4	19·5	—	7·55	3·7	—
1914	·86	34·4	—	1·06	—	9·4	182	49·2	—	10·8	24·1	—	8·38	15·1	—
1915	·89	39·1	—	1·06	—	9·4	189	54·8	—	11·0	26·4	—	8·67	19·1	—
1916	·92	43·7	—	1·05	—	10·3	200	64·0	—	11·9	36·8	—	9·11	25·1	—
1917	·96	50·0	—	1·05	—	10·3	208	70·5	—	12·7	46·0	—	9·46	29·9	—
1918	1·09	70·3	—	1·08	—	7·7	227	86·1	—	14·2	63·3	—	11·36	56·0	—
1919	1·34	109·4	—	1·48	26·5	—	207	69·6	—	14·5	66·7	—	15·19	108·6	—
1920	1·65	157·8	—	1·61	37·6	—	233	91·0	—	15·3	75·8	—	20·27	178·4	—
1921	1·94	203·1	—	1·84	57·3	—	240	96·7	—	14·0	60·8	—	23·49	222·7	—

MANCHESTER.

	Revenue per head.	Increase per cent.	Decrease per cent.	Fares per passenger.	Increase per cent.	Decrease per cent.	Journeys per head.	Increase per cent.	Decrease per cent.	Passengers per car mile.	Increase per cent.	Decrease per cent.	Operation Costs.	Increase per cent.	Decrease per cent.
	£			d.									d.		
1904	·75	—	—	1·2	—	—	161	—	—	9·0	—	—	6·78	—	—
1905	·77	2·7	—	1·19	—	·8	169	5·0	—	9·0	—	—	6·99	3·1	—
1906	·81	8·0	—	1·19	—	·8	178	10·6	—	9·1	1·1	—	7·10	4·7	—
1907	·84	12·0	—	1·19	—	·8	179	11·2	—	9·2	2·2	—	7·03	3·7	—
1908	·86	14·7	—	1·21	·8	—	178	10·6	—	8·9	—	1·1	7·07	4·3	—
1909	·87	16·0	—	1·19	—	·8	182	13·0	—	9·0	—	—	7·04	3·8	—
1910	·86	14·7	—	1·17	—	2·5	187	16·1	—	9·3	3·3	—	7·15	5·5	—
1911	·88	17·3	—	1·16	—	3·3	184	14·3	—	9·6	6·6	—	7·17	5·8	—
1912	·92	22·7	—	1·16	—	3·3	184	14·3	—	9·7	7·7	—	7·04	3·8	—
1913	·94	25·3	—	1·12	—	6·7	198	23·0	—	10·0	11·1	—	7·13	5·2	—
1914	·98	30·7	—	1·06	—	11·7	218	35·4	—	11·0	22·2	—	7·22	6·5	—
1915	·94	25·3	—	1·06	—	11·7	212	31·7	—	10·6	17·8	—	7·57	11·7	—
1916	·97	29·3	—	1·06	—	11·7	216	34·2	—	11·3	25·6	—	8·49	25·2	—
1917	·99	32·0	—	1·06	—	11·7	223	38·5	—	11·8	31·1	—	9·0	32·7	—
1918	1·13	50·7	—	1·12	—	6·7	242	50·3	—	12·9	43·3	—	10·19	50·3	—
1919	1·37	82·7	—	1·29	7·5	—	254	57·8	—	13·9	54·4	—	12·82	89·1	—
1920	1·59	112·0	—	1·34	11·7	—	285	77·0	—	14·8	64·4	—	15·33	126·1	—
1921	1·81	141·3	—	1·58	31·7	—	278	72·7	—	14·7	63·3	—	19·34	185·3	—

DISCUSSION.

Mr. J. Dalrymple (general manager, Glasgow Corporation Tramways).—Before beginning the general discussion on Mr. McElroy's paper I should like to draw your attention to a paragraph, which the secretary amplified while he was reading the paper.

The Secretary.—On the decimal coinage?

Mr. Dalrymple.—On the decimal coinage. The paragraph reads—"The urban passenger transport business is built up round coins. It is a small-coin cash business, and the unit in the past (with a few notable exceptions) was the penny fare." If you read the fourth paragraph on the following page, "Others think it is unwise to increase the minimum fare, especially as the next higher fare which the coinage permits, viz., 1½d., involves the use of two coins . . ." Now, Mr. President, I do not suppose we can go into the merits of this question to-day, but I should like to suggest that the Executive be asked to go fully into the question and report to this Association—to make a recommendation to this Association. There is no doubt that it is a mistake to have an initial fare paid by two coins, and what we want to-day is a coin which will purchase somewhat more than the present penny will purchase and somewhat less than the 1½d. I am of opinion, so far as I have studied the question, that the proposal which has been put forward by Mr. Allcock, viz., to

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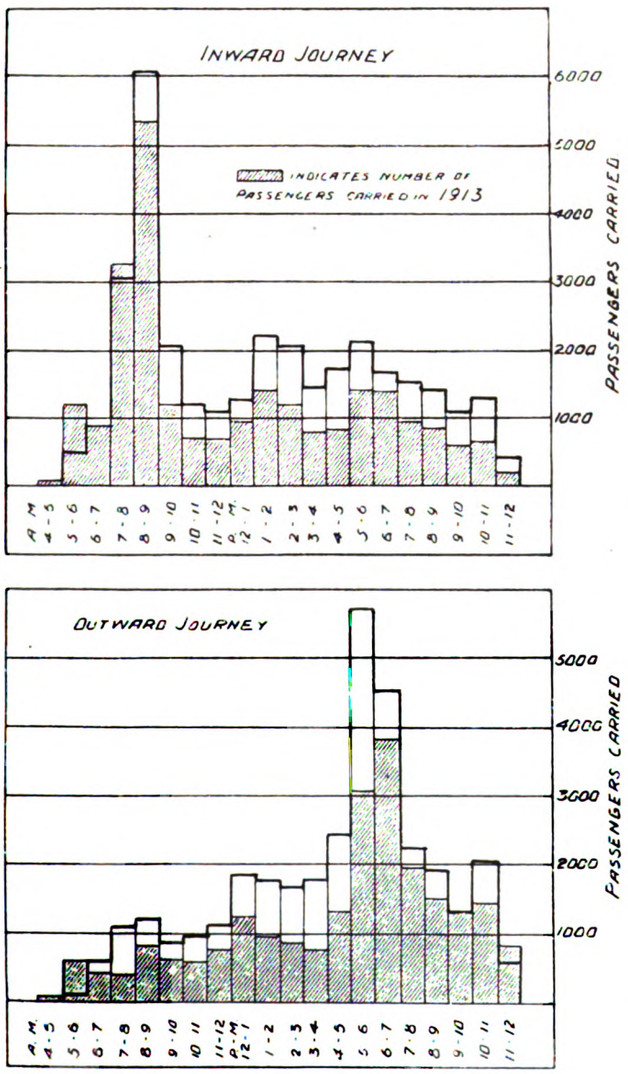
make the shilling ten pennies, is undoubtedly the simplest proposition that has yet been put forward, and I suggest that we should to-day ask the Executive to go fully into every phase of the question and report to this Association.

Mr. A. Baker (general manager, Birmingham Corporation Tramways).—Mr. President, I am quite sure that I shall be voicing the feelings and sentiments of everybody here if I say at once how much we regret the unfortunate absence of the writer of this paper, our old friend Mr. McElroy. The secretary read the paper extremely well, and I am sure he will not feel hurt if I say that we would rather have seen Mr. McElroy and have heard him this morning. I personally have to thank Mr. McElroy very sincerely for this interesting and useful paper. It contains much valuable information which I have no doubt many of us will like to refer to from time to time. It sets before us very clearly the extraordinary effects of the war on tramway finance. Who would have dreamed in those halcyon days, the early part of 1914, that tramway operating costs could have possibly increased in Glasgow by 210 per cent., in Leeds by 209 per cent., in Bradford by 222 per cent., or that the fares in Glasgow, the home of cheap fares, would have risen by as much as 40 per cent., in Leeds 54 per cent., or in Sheffield 66 per cent. and so on. Indeed, Mr. President, I do not suppose that there is a single town or city in Great Britain that has not been compelled to increase its charges to meet the enormously increased operating costs. Now this subject of increased operating costs, with the consequential increase of fares, is particularly interesting to me, because in the early days of the war, in September 1915, I had the temerity to read a paper at our conference which was held in London on financial problems as affecting tramways in war time. It may be remembered by those here to-day—I see many of them who were there on that occasion—that that paper was received with a great deal of criticism. My friend, Mr. Hamilton, was good enough to say that it was the most unpatriotic paper he had ever heard; he was proud to know that no other town in the United Kingdom had ever thought of such a thing outside Birmingham; he even brought up his chairman, Mr. Alderman Smithson, a well-known man in the tramway industry and a very well-known accountant, who said that what he had listened to from me was a fairy tale, or sounded like a fairy tale. I had merely mentioned the fact that to meet the extra operating costs in Birmingham, which at that time had only gone up between 10 and 20 per cent., it had become necessary to increase the fares in that city. I told the committee that shortening the distances allowed to passengers was actually an increase of fare. Of course by shortening the distances for the penny, 1½d., and 2d. fares we had increased our revenue by something like £1,600 or £1,700 per week; and I made the statement that Birmingham, being a large munitions centre, where everybody had plenty of money to spend and were freely spending it, many of them, on luxuries at extravagant prices, I thought it was a good idea to get some of that money for the tramways while it was about. Mr. Alderman Smithson characterised that as unadulterated selfishness on the part of Birmingham, and Mr. Baker included. Even Mr. McElroy, the writer of this paper, emphasised the desirability of it not going out from that conference that what we had done in Birmingham with regard to raising the fares was the right thing to do. Mr. Alderman Smithson said he was undoubtedly of opinion that by the end of 1915 things would have been normal again, and that we should find that there would be no necessity whatever to raise the fares to meet the increased cost. That, as I say, gentlemen, was when the expenses had gone up some 10, 15, or 20 per cent., and here to-day we see that all over the country operating costs have increased by something like 200 per cent. I was very much criticised, Mr. Chairman, because I said that war bonuses, in the majority of cases, would be claimed as war wages when there was no war. The war allowances to dependents, I submitted, would, of course, disappear, but there would remain other responsibilities in regard to wounded soldiers, disabled soldiers, which was sure to keep operating expenses up. Further, it was argued that, generally speaking, traffic receipts would be higher all over the country than they were, particularly in manufacturing centres; then the question was asked, why raise the prices? My reply was that we had to get the money somehow, and the only way we could possibly get the money was to increase the price of the article we had to sell, and that was the tramway ride. It is quite easy for anybody to get up and say, "I told you so;" I do not want to occupy that position, but I think as I was soundly trounced on that occasion by some of the great experts of our Association—(laughter)—I may point out, without saying "I told you so," that my prophecy has come fairly true. Well, sir, having thus delivered myself of an old grievance against some of my best pals—there are many things in Mr. McElroy's paper which I am sure will appeal to all of us engaged in this great business. I was particularly impressed with the few paragraphs Mr. McElroy has written with regard to the omnibus competition with tramways. The unfairness of suggesting that omnibuses should come out during the heavy periods of the day speaks for itself. I wish to thank you, Mr. President, for giving me the opportunity of making these few remarks, and I have no doubt that other gentlemen who have some of their own to get back will now take the opportunity of doing so.



Rochdale Road Route—Manchester Corporation Tramways.
Diagram showing the number of passengers carried each hour of a typical day in July, 1921 (Mr. McElroy's paper).

Mr. J. B. Hamilton (general manager, Leeds Tramways Committee).—I certainly did not expect my esteemed friend and very old colleague, Mr. Baker, would have had the temerity to go back and tell us what he said six years ago. As an expert witness, frequently under trial, he knows the difficulties, the disadvantages, and the possibilities which raking up precedents of that kind may draw upon him. I deprecate, gentlemen, here in this meeting, and particularly in a paper of the utmost gravity, ably setting forward conditions which I think require the consideration of this meeting, that we should interpose for a moment to say what we have said in the past. I have said a good many things in the past—(laughter); some of them have been taken down; and I can tell you that I look with fear and trembling when I see people coming into the room with books under their arms. The whole question is history; it is gone; it is past. I think we have all done the best we could and we hope to go on doing so. Whether Mr. Baker is entitled to a claim of prescience and foresight, which none of the rest of us are, I leave him to decide; but one of the great difficulties of this war—and I well know it—has been the readiness with which advances were granted for labour because of the ability to pass them on to some other person; and the reason for the action of Birmingham on that occasion, as Mr. Baker tells you, was that as the money was going about they thought they had better have some of it. That was the tone of his paper.

Mr. Baker.—Oh, no.

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Mr. Hamilton.—I think that was the action. That was the thing that led, amongst other things, to the great rise in the cost of living and, incidentally, very largely, to a great deal of the trouble from which we suffer to-day. No one in the tramway industry could have had increased costs in 1915 but what were of a trifling character. As a matter of fact, in most towns, most well managed and well governed towns—I include Birmingham with them—increased fares did not become general until 1918. My friend Mr. Barnard, from Bolton, if he had been speaking six months ago, would have told you that in their case the fares were not increased until that date. I do not want to say any more about that. I leave it with Mr. Baker. I think the subject matter of this paper, as I have said, is a very serious one for us all at the present moment. What has taken place in the past is less serious than the question of what is going to take place in the future, and it is to that which we should address ourselves. Mr. McElroy—and no one regrets his absence to-day more than I do—has been very careful in not promulgating any particular method which in his view will meet the conditions in the future. He has not said anything with regard to what we are to do in the future. Perhaps it shows his wisdom; I know he shows his very great caution, and had he been here to-day I think not only myself but many others would be asking him what he thought should be the method of dealing with passenger transport in the future. I will say that he has given us some data which is exceedingly useful with regard to what has taken place during the war years. I do not think anybody here expects to live through another war period, but should it come, then the facts and the particulars which are set out here will be of the very greatest importance. Now, I join with Mr. Dalrymple very strongly with regard to the consideration of the division of the shilling into ten portions. I see Mr. Allcock here, who is the inventor of the idea, and perhaps, Mr. President, you will give him an opportunity, if you think it advisable, of saying a word or two. But whilst I join with Mr. Dalrymple with regard to sending it to the Executive, I begin to think sometimes of what you expect that body to do when it meets. We are students of fares and all the other questions which centre around an alteration of our coinage. If we are going to take up this matter I think we ought to be able to co-opt some specialist on the coinage, such as Mr. Allcock, and then we might come to some definite resolution which we could recommend. But there is a good deal to do after that. I freely confess that I do not quite appreciate why Mr. Dalrymple should put this forward, because it is a well known fact that if you put forward a fare which represented 1½d. that would not satisfy his friends in Glasgow. They would at once want to halve it. (Laughter.) However that may be, gentlemen, I think in that lies a great deal more than is apparent. The single coin, as the sheet anchor of tramway finance, would go a long way towards settling, on a uniform basis, the difficulties which Mr. McElroy has portrayed here. It is, I think, a great pity that greater uniformity should not have been shown by municipal operators throughout the country in the alteration of fares. Some would have liked to go to 2d. fares, but we cannot get that in Leeds. I know some have them and think them very satisfactory. Others have kept to the penny, and others have shifted stages. It is probably too much to expect uniformity in every degree, but I think we might have had a very great deal more than at present so that we could, in different towns of the country, have something like a basis upon which to work. It is necessary there should be some variation, because density of traffic has a great deal to do with the cost at which you can handle it, but I do think that if we have a discussion on the question of what is the best method of setting out fares it might be helpful. I am proud to think that many municipalities frequently make reference to the things that have been said at these conferences as showing a general knowledge of the subject. I think discussion with regard to the incidence of low fares or high minimum fares might be helpful to us all.

Mr. H. Mozley (general manager, Burnley Corporation Tramways).—While this inquiry is going on in regard to the coinage, a great deal of time will, in a sense, be wasted before we can take advantage of it, and I think, perhaps, it would be useful at the present stage just to suggest one way out of the difficulty—a way that was forced upon us by our own people in Burnley. We proposed at first to put into operation the 1½d. minimum fare, but we were told to go back again and reconsider the question, and we did so in this way. We separated the half mile sections into an independent fare list, the penny fare stage only, and kept it entirely independent of the ordinary fare list, and it is working exceedingly well, without any complication or difficulty for the conductors. I think you might consider that, as a help towards solving the question, so as to avoid having to go on to a 1½d. minimum fare and deprive your short journey passengers of the penny fare. The plan is working extremely well.

Mr. J. Barnard (general manager, Bolton Corporation Tramways).—I am sure we are all indebted to Mr. McElroy for his excellent paper, but I should have liked him to give statistics of some of the smaller towns because he has included all the large cities in the kingdom and not the smaller towns, which, I think, would have been very interesting to us. I do not think that the increases in the cost of operating that have taken place will be a bad lesson for us, and more especially for the towns that are enumerated in this paper, because I think they have a lot to blame themselves for. As you remember, prior to 1914, it was a race between the big cities as to who could give the biggest run for a penny, and there were some towns fortunately which did not try to compete with them. As you have heard from Mr. Hamilton, we, in Bolton, stuck to a rigid mile and a half for a penny. I am proud to say that until April of this year we never had occasion to touch that fare, and then we only raised it by ½d. per stage. That proves, of course, that we have got a 1½d. minimum fare; but I am, further, pleased to inform this conference that at our Council meeting, which will be held a week to-day, we expect to give concessions back to the travelling public. I think that is a record that we in Bolton have reason to be proud of. With regard to what Mr. Dalrymple has said with reference to the coinage, I think it will be obvious to you that had we in Bolton been able to charge, say, a coin of not more than the value of 1⅛d. or 1¼d., it would have carried us over our difficulties, and we could have left the stages as they were by just increasing the fares by that small amount. As one of the Executive, I shall certainly do my utmost to further the introduction of some different coin, because I think it is the only salvation for our tramways.

The President.—Before we adjourn I will ask Mr. Allcock to say a few words. I can give him two or three minutes only, but if he will kindly give the conference a brief outline of his scheme, they would be obliged and it would be very useful to us in the future. Mr. Allcock is connected with the firm of Messrs. Glover and Company, of Trafford Park, and he is the author of this scheme.

Mr. H. Allcock.—I had no idea when invited to attend this conference that I should be asked to speak, so I do so entirely without preparation and you must forgive any deficiency. Let me plunge at once into the heart of the subject as I see it. Those responsible for the financial control of the tramway departments throughout the country are beginning to appreciate, as I see it, that it will be impossible to maintain for very much longer the comparatively high fares which have been more or less cheerfully paid so long as the passengers had money in their pockets. Reference has been made by earlier speakers to that aspect of the case, but I think we must now appreciate that the growing poverty of the tramway passenger will mean that he will have to refuse to pay your high fares, and he will have no alternative but to walk. That is one side of the question. On the other side, there will immediately arise a demand for the restoration of the original penny fare, and so far as one can judge, the finances of your various undertakings will not permit that return because the cost of your labour is higher and, as I understand it, permanently higher. There is therefore a great opportunity for you tramway gentlemen to advocate, not a new system of coinage, or anything of that kind, but simply an adjustment of the existing coinage values to bring them more into harmony with present day requirements. In that connection I want to say that previous attempts to decimalise coinage in this country have failed chiefly because they have been of too ambitious a character. The Royal Commission examined certain proposals two years ago, and the method they had under consideration involved the issue of several new coins and the withdrawal of several existing coins, as well as a general knowledge of decimal calculations on the part of the man in the street. This was considered too ambitious, and the attempt failed. The present proposal simply says—Make the existing penny coin worth more; alter nothing else. Say there shall be ten coins to a shilling and each coin will have the purchasing power of 1⅛d., and it will produce a uniform penny fare without hurting tramway undertakings. On the one hand, the passenger would consider it a very substantial concession to have his penny fare restored to him, and tramway managers, on the other side, would appreciate that each of these penny fares would bring in 20 per cent. more revenue than it used to do. It is a case of meeting both sides.

Mr. E. Hatton.—Does the gentleman who has just spoken intend to take a shilling in ten coins from the public and pay our men at the rate of 12 pennies in the shilling?

Another Speaker.—May I also ask whether we can have a coinage that will simply apply to tramway purposes? I cannot appreciate that everyone else will also drop to ten in the shilling.

The President.—As far as I have understood it, it is to be a national coinage, and whatever we buy or sell we shall deal in at the same value. That is correct, I believe.

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The Secretary.—It is proposed that Mr. McElroy should have a message from you, and the Executive suggests that I be instructed to send this telegram—

"The twentieth annual conference profoundly regret the cause of your absence to-day, send heartiest good wishes for speedy restoration, assure you of their high appreciation of an excellent and characteristic paper, and hope soon to have the advantage of your experience on the Council once again."

The conference then adjourned for luncheon, which was served at the Town Hall, Pendleton, on the invitation of the chairman and members of the Salford Corporation Tramways Committee.

THE LUNCHEON AT PENDLETON TOWN HALL.

The Mayor of Salford presided. Proposing "The Municipal Tramways Association," he said this was a toast which was well received in every town in Great Britain. He congratulated the Association upon the work it was doing for the tramway industry throughout the country and hoped it would continue its good work for a very long time.

The President, responding to the toast, thanked the Mayor and the Tramways Committee for their hospitality, and recalled a previous visit of the Association to Salford.

Alderman J. Timpson, J.P. (Mayor of Portsmouth), proposed the health of the Mayor of Salford and referred in an appreciative manner to the welcome which Salford had given the Association.

The toast was drunk with musical honours.

The Mayor of Salford replied.

AFTERNOON SESSION.

MESSAGE TO NEW ZEALAND TRAMWAYS ASSOCIATION.

Before the discussion on Mr. McElroy's paper was resumed it was agreed that the general secretary should send to the Dominion Tramways Association of New Zealand a letter of felicitation and goodwill from the Association with all the documents of last year, expressing a hope that their New Zealand associates may emerge successfully from the aftermath of the war.

Discussion on Mr. McElroy's Paper Continued.

Mr. W. Murray (general manager, Walthamstow Council Tramways).—I think there is one phase of the subject which has not been touched upon, and to which we might with advantage give some little consideration. In Mr. McElroy's paper he very clearly and emphatically sets out that the cause of our difficulties at the moment is largely due to the great increase of working costs as compared with the increase of revenue per head of the population. The balance of accounts has been upset so that many undertakings, instead of being prosperous and coming out well on the right side, have found themselves making a loss, and it seems to me that we might with advantage consider whether it is possible to readjust those values. There is need either for increasing revenue or for decreasing working costs. Now, in recent years we have been striving, and striving successfully, to increase revenue by raising fares. I think you will agree that this can no longer continue—that we are unable to raise fares further with that end in view. It is an economic truism that increased cost of production under normal conditions is always followed by a decrease in demand. That is common experience. We have found it so with regard to our tramway fares. When we raised fares, while gaining in revenue we have almost invariably lost in passengers, and I feel we have now reached such a point that were we further to increase fares, the probability is that we would not only lose more passengers but probably actually lose in revenue also. If we cannot put the balance right by increased revenue through raising fares, it seems to me the only alternative is to do something definite, if possible, towards reducing working costs. Now working costs can be reduced either by reducing wages or by readjusting the conditions of services or by improved efficiency. I am not going to discuss reduction of wages, because that will probably rectify itself; and I feel, in London at least, that our men have been somewhat badly used of late as compared with other workmen, but I think in increasing efficiency in all branches of tramway service, education of the men and a close supervision might have very beneficial results. Greater efficiency so obtained would mean as a natural corollary increased revenue and decreased costs, as in the same way in the workshop it would mean increased output. I dare say we all have one or more men who turn out better work, and more of it, than the majority of their fellows. Indeed, the tendency which has been manifest of late to level downwards is, to my mind, utterly ruinous, and we ought to strive by every means possible to level upwards, so as to increase the work done—the output of the works—which would certainly tend to reduce working costs, i.e., the cost of repairs and the cost of maintenance. Applying that to motormen, it would have the following results. It would mean increased effort towards economy in power consumption; it would mean increased effort to avoid accidents, the cost which follows accident, and the time lost, and all the public inconvenience which these entail; and it would encourage them to a still greater effort towards regular running and an equal spacing of the car service. In the case of conductors, it would encourage a greater effort to the effective collection of fares and it would encourage more courtesy towards the travelling public. I have seen, and I have no doubt many others have seen, a case of a layman walking with a crutch, and perhaps an old lady or possibly a young woman with a child in her arms and another at her feet, struggling to board a car, and the conductor looking on and failing to give a helping hand. These things are fairly common. I venture to suggest that a man acting in that way is doing himself no credit, but is bringing discredit upon the department which he serves. If we could by any means educate our men up to giving more courtesy, more consideration, more desire for the well-being and the prosperity of the undertaking we are concerned with, it would go a long way towards improving our present condition. I feel that in the immediate future there is no hope of revenue improving while the present slump in commerce and trade continues, but if we can get better service from all members of our staff, I think it would have the effect of improving the revenue and keeping down expenses. I would like to suggest that this matter is vital, not only to the undertakings concerned but to the welfare and well-being of the men themselves, and we ought to keep this persistently before us. I am inclined to feel that if tramways are going to continue indefinitely in the present position, making an annual loss—probably a growing loss—they are doomed, and the result of that would be that many men working on tramways to-day might perhaps later on find themselves in the human scrap heap. I have been turning this over in my mind for some time, and I purpose making an effort to meet it. If this were fairly put before the men and their interest in the matter shown to them, and a persistent effort were made by all classes in the undertaking to get a more efficient service, I am sure it would be all to the good. I should like to refer to one other thing which I think would help us, and that is a revision of the 1919 National Agreement. To my mind there are some features of that agreement which have been absolutely disastrous to many undertakings.

The President.—I think we shall have an opportunity of discussing that later.

Mr. Murray.—Thank you. Will you allow me to refer to one matter, because it is on my mind and I want to relieve myself of it. (Laughter.) That is with regard to the spare list. This, especially to small undertakings, is of vital importance. Take our case at Walthamstow. I could employ profitably on a Saturday and a Sunday 10 or 12 per cent. more men than I have any use for during the week. Under this agreement, if I am going to have these men on a Saturday, I have to retain them all the week and pay them a full week's wages for two days' work. I submit that this is a burden which is unfair and must frequently become impossible. The result is that I have either to do what I suggest or put the men off to walk the streets, and I say it is not in the interests of the department or the men that this state of affairs should continue. I am glad to have your assurance that the matter is to be raised. I hope, in the interval, that every manager concerned, and every member of a Council owning a tramways undertaking, will give it serious consideration, so that when it comes to be dealt with they will have the matter in their minds and come to a decision upon it. The matter is particularly important to many of us, and I hope that we shall succeed in getting some relief from conditions which are fast becoming intolerable.

Alderman W. Walker (vice-chairman, Sunderland Corporation Tramways Committee).—I think the present financial condition of many undertakings is going to be an incentive to put our house in order. It may be a blessing in disguise. If there are the inefficient, as Mr. Murray has suggested, and if he has exhorted them, and other managers have done the same, and they still are not repentant, then I should simply sack them. I mean to say we have in the past tolerated far too many inefficients on the tramway systems, and it does not seem to me that we can afford to have any but "efficients." If we can educate, we ought to do so, and I think it ought to be possible for the laymen and the experts to get the

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men together and give them lectures along broad lines towards that efficiency in the handling of passengers and also the handling of the car that will mean retrenchment. I was highly delighted when Mr. Baker, of Birmingham, told us exactly how things were in 1915, and how they would be, and also by the reply of the Scotsman from Leeds (Mr. Hamilton), and it does seem to me that in the suggestion of Mr. Dalrymple this morning as to the coinage—of course, it is Mr. McElroy's suggestion also—we might find a help. If we could get a coin between the penny and 1½d. it would help us; and we ought to go forward with a strong resolution to the powers that be, if we are of one mind in the matter. I know there is another side of the question. It does seem to me that we cannot afford simply to sit down or we shall go bankrupt. We have to get a hustle on; we have got to move very quickly, and if we cannot raise fares to 1½d. we might get them up to 1¾d. We have tried the penny stage in Sunderland, but we have not got into that state of mind that we can sit down and face a big profit. Like other undertakings, we are grappling with serious difficulties in the way of reverse balances, and we have got to see how we can get out. I do not think there is any one way out, especially in the teeth of a trade depression such as the country is suffering from to-day, but I believe we can gather the collective wisdom of this conference and of the Executive Council to give us a resolution along the lines of the revision of the coinage, and also do something in the way of educating or hustling our men. No stone should be left unturned towards making our systems profitable. We have no right to make them a charge on the ratepayers; they should be self-supporting at least, if they are not going to show a profit.

Alderman W. C. Shipley (vice-chairman, York Tramways Committee).—I hope we shall not go forward with this proposal respecting the currency without giving it due consideration. We heard some time ago a great deal about ninepence for fourpence, but when you come to talk of a shilling for tenpence I think we shall find the boot on the other foot. To consider that it is possible to induce the powers that be to alter the currency simply to accommodate the tramway system of the country, appears too silly for words, and I hope we shall not hear any more of this proposal.

Mr. A. T. Eardley (general manager, Stockport).—I should like to know if there is any difference between the proposal of Mr. Allcock and the metric system. He proposes the ten-penny coinage or a franc. Referring to the statistics for Sheffield, we often hear it said that an increase of fares results in a decrease of revenue.

The Secretary.—No, no; the other way about.

Mr. Eardley.—If you take the figures given for Sheffield you will find the fare per passenger in 1921, as compared with 1904, shows a 66 per cent. increase, which is higher than any other of the five towns, but the revenue per head shows 272 per cent. increase in 1921, as compared with 1904, which is also higher than either of the five towns. Therefore that shows that increasing the fares does not necessarily result in a decrease in revenue. What it shows is that you must have regard to the particular industries carried on in the locality. Probably Sheffield has been doing very well at munitions, and that may account for it, but it is there; you see it from the figures.

Mr. A. R. Fearnley (general manager, Sheffield Corporation Tramways).—When I read this paper I tried to ascertain how we are to look at this problem. It seems to me that Mr. McElroy has said to himself—"What is the present position of the tramway industry, what is wrong with it, and what is the remedy?" Mr. Eardley, I think, has struck the keynote, so far as my view of the situation is concerned. Mr. McElroy has set out the remedy, although Mr. Hamilton apparently did not think he had. He says—"All these factors illustrate the soundness of the policy of cheap fares, which resulted in increased travel and greater revenue. . ." That, in my opinion, is the key of Mr. McElroy's notes, and Mr. Eardley has struck a very important point in his reference to this summary. The difficulties Mr. Eardley refers to are really very significant, and the point is this, that the fares in Sheffield were the lowest we could have. We simply used the two lowest coins which could be used, viz., the ½d. and the 1d.—half a mile for ½d. and three miles for 1d. This large increase of 66 per cent. is brought about to a very considerable extent by abolishing the ½d. fare. This large increase was not really an increase, seeing that in doubling the fare we also doubled the distance. If you lengthen the stage from half a mile to a mile for ½d., there is something in that point of view. I would like to emphasise this fact, that I think we have a better opportunity of increasing the popularity of the tramways and getting back to our pre-war condition of prosperity by giving this matter attention rather than the matters referred to by our friend from Walthamstow. Frankly, I will not admit that we employ many men who are inefficient; that we employ men who do not try to obtain passengers or customers for our business; but, on the other hand, I say it is up to us to give every possible inducement to the public to again commence using the tramways to the same extent that they did before. I think I am entitled to refer to this, because I am not responsible for the policy in Sheffield. It is the committee who is responsible for it, and who has definitely set the policy which has led to the revenue per head of population reaching a 272 per cent. increase. The number of journeys per head of population in Sheffield is only beaten by Glasgow and is not beaten by any tramway in England. This is a credit to the policy of the tramways committee in Sheffield, which has been to charge the lowest possible fare. The figures in the paper illustrate the soundness of the policy of decreased fares, and I am quite sure it will be to the benefit of the ratepayers and the inhabitants and the tramway industry generally.

Mr. W. Murray (general manager, Walthamstow).—Will you just allow me to say a word. I am surprised I should need to do so. I was not speaking of general inefficiency in the industry; I was speaking for greater efficiency, and I say there is room for that in most of our undertakings. I was not accusing our undertakings of general inefficiency but was pleading for a campaign for still greater efficiency.

Mr. R. H. Wilkinson (general manager, Bradford Corporation Tramways).—It is interesting to note, Mr. President, that our journeys per head have shown an increase of 96 per cent. in 1921, as compared with 1904. That is the highest increase of all those quoted, with the exception of Sheffield, and I mention that because I am one of those who plumped for the 2d. fare twelve months ago, and the 2d. fare has been a great success. We had 1½d. fares in operation previous to the adoption of the 2d. fare; and when the 2d. fare commenced the extra income derived from the change in the first week was 32 per cent.; the average for the twelve months' working on October 1 next will be about 25 per cent. gain in income as against what we earned when the 1½d. fare was in operation. I think that fact, coupled with the journeys per head being 96 per cent. increase, ought to be convincing proof that as far as Bradford is concerned the 2d. fare is the right fare to adopt, as a minimum or initial fare.

A Speaker.—What is the percentage increase on the 2d. fare?

Mr. Wilkinson.—You can make your own calculation. When we had the 1½d. fares and altered them to 2d. fares, the increase in the revenue over what we used to have with the 1½d. ticket was 32 per cent. for the first week, or 25 per cent. on the twelve months.

Mr. J. B. Hamilton.—Perhaps you will permit me, as one of the oldest colleagues of Mr. McElroy and one of the oldest members of this Association, to propose that the heartiest thanks of this conference be given to Mr. McElroy for his very excellent and instructive paper. We are all very sorry he is not with us, and we hope sincerely that the time will soon come when he will be back again. I feel sure that had he been present to-day there would have been many remarks he would have been able to make illustrating some of the points in the paper. I would ask you to give a unanimous vote to Mr. McElroy, conveying to him the feeling of this conference for the paper he has been good enough to write.

Mr. A. L. C. Fell (general manager, London County Council Tramways).—I have not had an opportunity of discussing Mr. McElroy's paper, but so far as London is concerned I think possibly we might be able to write an entire paper on the London difficulties alone. I congratulate Mr. McElroy most sincerely on this very able paper. I think we should all like to digest it. The points that have been raised, like those of Mr. Murray, could well be referred to the managers' section at their next meeting. I am very sorry that Mr. McElroy is not here to answer the questions that have been put, but I have much pleasure in seconding the vote of thanks moved by Mr. Hamilton.

The President.—It has been proposed and seconded that our heartiest thanks be tendered to Mr. McElroy for writing this paper for this conference, and I am sure he is as sorry as we are that he is not present.

The vote of thanks was carried with applause.

The President then called on Mr. Hamilton to read his paper on "The Operation of Tramway and Omnibus Undertakings under Statutory Powers in relation to the Roads Act, 1920."

Mr. Hamilton, in introducing the paper, said—I want to say quite frankly that I think the title of this paper was the principal difficulty in preparing it. We want to get into some compressed form the views which some of us on the Executive Council hold with regard to the new Development Section of the Roads Act, and the effort which is contained in the title of the paper is the consequence. I am afraid it is not very clear, but I hope to make it clearer in the paper.

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THE OPERATION OF TRAMWAYS AND OMNIBUS UNDERTAKINGS UNDER STATUTORY POWERS AS AFFECTED BY THE ROADS ACT, 1920.

By J. B. HAMILTON
(*General Manager, Leeds City Tramways*).

The marvellous development in the use of road transport vehicles, largely in consequence of the advent of electric traction on rails since its commencement in England about thirty years ago, is known to you all, and has been very fully dealt with by my friend Mr. McElroy in his paper on "Some Phases of Tramway Developments in the Past, and the Outlook."

To enable greater realisation of the wishes of the public for this form of cheap and quick transport Parliament showed its confidence in municipal operation and in the practicability and usefulness of tramway undertakings by sanctioning great extensions of routes, not only within the city or burghal territory, but also into many districts surrounding. Extensions have also been made in many cases from one borough to another, and in addition to these powers many public authorities have readily obtained sanction from Parliament to the operation both within and without their boundaries of motor omnibuses and railless traction into districts in which the capital cost of tramways was not justified by a sufficient density of population.

In the application to Parliament for these powers, whether by a company or by a public body, frequent opposition was made by railway companies in the earlier days on the ground of competition. In no case, however, has this been permanent or successful, and apparently the railway authorities have now accepted the inevitable and probably come to the opinion which has always been held by tramway authorities—that they cater for a different class of people, namely the shorter distance rider, and in fact are ancillary to railways by bringing people to and taking them from their stations.

The fact that for this form of transit large expenditures have to be made in road works and in the supply of the necessary depots and power stations has given confidence to the public as to the permanence of the form of transport, and in all parts of the country where tramways have been established there is invariably a very large development of buildings both for commercial and residential purposes following the line of tramways.

In the great majority of systems in the country it was found possible to grant fares at rates which were considerably within the powers as to charges granted by Parliament. In most of the large cities the actual fares charged were not more than 50 per cent. of the rate which could legally have been charged.

These extremely economical fares, which were enabled to be charged owing to the low cost of operation, constituted only one of the advantages which this form of transport brought to the various communities where it was established.

Each tramway must maintain the part of the roadway on which it is placed and for 18 inches outside, and although the surface is subject to the wear of all vehicles, no financial assistance is granted by the Roads Board Section of the Ministry of Transport. It also pays rates on all its street works in addition to depots, offices, and power stations, and I have made a careful examination and estimate of the annual amount which a tramway provides in the relief of public burdens with the following result, so far as Leeds is concerned—

(1)	Rating assessment on lines only, £40,211 at 16s. in the £ = £32,169. Average amount paid per car per annum ...	£124
(2)	Annual cost of paving repairs and renewals, £43,708. Annual charge per car	168
		£292

In many towns the fact is frequently overlooked that the tramway undertaking is usually the largest ratepayer, besides maintaining road surfaces and often paying a considerable proportion of widenings and improvements. These figures, which are comparable with the £70 or £80 paid annually by a motor omnibus show that apart from its other burden a tramcar contributes four times as much to the public purse as any other form of traction.

As I have indicated, every tramway which is established in the country has been the subject of consideration by Parliament as a whole and before Committees of both Houses and various Government Departments. The necessity for the granting of the powers, the actual position of the track and its constructional form have been most carefully studied before the necessary sanctions have been obtained.

Broadly speaking, I think we may claim that electric tramways, which, like giant shuttles, have ceaselessly plied their woof athwart our cities, have invariably performed a beneficent and useful function in the building up of great communities, during the last quarter of a century, and are well worthy of the important duties which they execute in facilitating business movements and in social life in all parts of the country.

During the war this form of transport, in conjunction with every other type of road and rail vehicle, suffered in its efficiency and development owing to the demand for labour essential to the successful issue of the great war.

The termination of hostilities left tremendous arrears of permanent way which required large repairs and renewals, and consequently during the great boom in trade which followed the Armistice and continued for nearly two years, it was utterly impossible adequately to supply the whole of the public demands for travel in the same satisfactory way as had been previous to the war. In addition to the difficulties suggested, the cost of such renewals became almost prohibitive.

To meet these post-war difficulties fares have had to be increased. The effect of this has unquestionably led to less use of the facilities,

Mr. J. B. Hamilton, C.B.E.

but generally speaking the public have realised the necessity for the increased fares and accepted the new conditions.

There are very distinct and gratifying evidences of a possibility in the near future of gradually getting back towards pre-war costs. The price of all materials which are necessary for the maintenance of the undertaking and wages and salaries are slowly following the "cost of living" on the downward grade.

There is, of course, considerable leeway to make up in losses which have been carried forward for the last few years, but I believe notwithstanding the present acute depression that these will be cleared off and the industry thoroughly reconditioned if we are not subjected in the near future to unjustified competition with a relative reduction of revenue.

Previous to the war there was considerable development of self-propelled internal combustion vehicles utilising petrol or benzol as the propelling force. Powers were granted to public authorities in many cases to utilise these vehicles for traffic in less populated districts, but in all cases during the last eight or nine years a charge

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for road adaptation and for maintenance of the highways thereafter was imposed.

Until 1916 the curious anomaly was continued under which privately owned vehicles of identically the same type and road wearing effect as municipally owned ones could be run without any corresponding road charges being made whatever. In that year, however, powers were granted to road authorities under the Local Government Board Emergency Road Legislation Act to enforce a road maintenance charge as a condition of operation.

This Act continued in force until the official termination of the war on August 31 last, and gave considerable protection to municipal operators of tramways as in many cases they are the road authorities in their area and could refuse sanction to ply for hire over their highways. With the death of the Act and the birth of the Roads Act, 1920, a new set of conditions and a great danger to the successful continuance of tramway operation has arisen. I shall not attempt to deal with legal intricacies, but give instead the plain statement of the case by an eminent Parliamentary agent.

"I shall not attempt to trace the legislative history of the present position which may be taken to date back to the time of the Town Police Clauses Act of 1847, but will draw your attention to the Finance and Road Acts of 1920. Under the former the duties of excise were imposed in respect of mechanically propelled vehicles used on public roads.

"By Section 7 (4) of the Roads Act, the Minister of Transport is empowered on the application of a road authority, after holding a public inquiry, to prohibit or restrict the driving of vehicles of any specified class on any specified highway within the area of the Council in any case in which it appears to him as the result of the inquiry to be proved 'that a vehicle of that class cannot be used on that highway without endangering the safety of the vehicles or the persons therein or of other traffic using the highway or that the highway is unsuitable for use by a vehicle of that class.'

"This clearly limits the powers of refusal to the three points referred to therein.

"The war having officially terminated on August 31, 1921, the position now is that Section 37 of the Town Police Clauses Act, 1847 (which has never ceased to be in force) will continue in operation subject to the provisions as to appeal contained in Section 14 of the Roads Act, 1920.

"The effect of this will be that whenever application is made for a licence for an omnibus to ply for hire the application will have to be considered judicially, and that unless there are valid reasons for refusing it the application must be granted without payment of any fee, there being a right of appeal to the Minister of Transport against an unreasonable or improper refusal or against unreasonable conditions attached to the grant of the licence.

"It would not be practicable to give a complete category of reasons which would be held to justify the refusal of a licence, but no doubt a licensing authority would be entitled to refuse where there was already in their area a sufficient number of licensed vehicles of the class for which a licence is applied for or where the circumstances of the area were such that the use of the proposed vehicles would be a source of danger or would cause serious obstruction to other traffic entitled to use the roads.

"On the other hand, we think it is practically certain that a licensing authority would not be considered to be justified in refusing a licence merely on the ground that the running of the proposed vehicles would set up competition with a service of tramways or omnibuses of the authority.

"Such licences entitle the holders to ply for hire within the area of the licensing authority, and although the power to attach conditions to a licence would probably include the right to grant it subject to the condition that the vehicle should not be run, e.g., over a particular bridge which was not strong enough to bear its weight, we do not think that this power extends to enable the licensing authority to restrict except in some such manner the routes on which the vehicles may run.

"Section 7 (4) of the Roads Act, 1920, provides machinery by which a County Council or the Council of a county borough may secure the prevention of the use by vehicles of a specified class of specified highways, but the grounds on which such action can be taken are expressly limited and do not in our opinion permit of the taking into consideration of the question of competition with a transport authority of the Council.

"These grounds are—

"(*a*) That a vehicle of the class in question cannot be used on the highway without endangering the safety of the vehicle or the persons therein.

"(*b*) That such a vehicle cannot be used on the highway without endangering the safety of other traffic using the highway.

"(*c*) That the highway is unsuitable for use by a vehicle of that class.

"(*a*) The first of these grounds clearly has nothing to do with the question of competition with other transport services.

"(*b*) The second ground relates to the question of physical injury to other vehicles using the highway and not to the question of financial injury to the owners of such vehicles.

"(*c*) The third ground in our opinion clearly relates to the physical conditions (width and structural ability to bear the traffic) of the highway. We do not think that a highway could be said to be 'unsuitable' for use by a certain vehicle because such use would set up competition with another transport service."

The effect of all this seems to be that an owner of a vehicle who has paid the Inland Revenue tax required for carrying passengers cannot be refused on application for right to ply for hire in an area, except upon the three grounds I have referred to.

Neither of these provide any remedy to a local authority or a private company operating under statutory powers tramways, light railways, railless or motor omnibus services on any road on the ground that the service is unnecessary and wasteful in the public interest and injurious to the statutory undertakers.

It is surely a gross misuse of public duties which permits a competition being set up in passenger services by any casual person who may be the owner of a mechanically propelled vehicle. No examination as to its suitability for this class of work may have taken place and yet they may run it at any time without obligation with regard to fares or services.

Such operation may be most unprofitable for themselves and disastrous to the legally appointed operators of tramways, and yet they are within the law as it stands at present if they get the licence to ply for hire in addition to having paid the Inland Revenue tax.

In Sub-clause (3), Clause 14, of the Roads Act, 1920, it is provided that—"Where, upon application for a licence to ply for hire with an omnibus, the licensing authority either refuses to grant a licence or grants a licence subject to conditions, in either case the applicant shall have a right of appeal to the Minister of Transport from the decision of the licensing authority and the Minister shall have power to make such order thereon as he thinks fit, and such order shall be binding upon the licensing authority.

"An order made by the Minister under this sub-section shall be final, and not subject to appeal to any Court, and shall, on the application of the Minister, be enforceable by writ of mandamus."

Should, therefore, the licensing authority be of the opinion that sufficient services are already provided, whether by themselves or a company undertaking or by another local authority, they may refuse the licence, but the applicant has claerly the right to appeal to the Minister of Transport from the decision of the licensing authority.

The grounds of defence against such appeals are somewhat intangible and not to be definitely relied upon, but presumably the Minister of Transport in his wisdom may say that if a road is sufficiently served by an established, particularly a statutorily established undertaking, such services as are proposed to be given under the licence to ply for hire are unnecessary and superfluous, and therefore uphold the licensing authority in its refusal to grant a licence.

This, I think, is the crux of the whole position.

On the one hand there is an application to Parliament, a long and careful examination of the necessity for the service, a thorough examination of the physical condition of the roadway, the examination of the details of construction of permanent way and rolling stock, the establishment of a concern which undoubtedly costs large sums of money, the building up of a permanent service of a more or less remunerative character, the obtaining of the confidence of the public that such a service will be continued, the obligation to provide special services to labouring classes at low fares, and the imposition of a maximum fare for other passengers and goods and parcels, and so on, and on the other hand an application from a practically unknown person or company in the sense that they have not had to provide any public *bona fides*, the absence entirely of any obligation with regard to fares to be charged or a continuation of services, and the initiation of competitive services, which whilst they may be quite unremunerative to the new-comer, may so impinge upon the revenues of the established undertaking that they are unable to carry on with a low rate of fares.

Surely this was never intended when Parliamentary sanction was given for the establishment of passenger road transport undertakings, whether tramways, railless or motor omnibus, which by custom and precedent have always been looked upon as a monopoly of services on that particular section of route for which they were granted.

In recent promotions where local authorities have asked for powers to run omnibuses over routes beyond their boundaries, if there has at any previous date been a service, however slight, by

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private enterprise, petitions have been lodged and the case fought before the Parliamentary Committee. No definite ruling has so far been made by these authorities that if a motor omnibus service was being operated on a route by a non-statutory proprietor it should constitute a monopoly, but undoubtedly very great consideration has been given by many committees to the fact that motor omnibus services although without statutory powers had already been running upon these routes. The first comer has claimed a right to the monopoly of motor omnibus services, and in quite a number of instances has succeeded in inducing committees not to grant natural extension of omnibus services by tramway operators from suitable traffic points.

One sees clearly, therefore, that these people who may propose to operate vehicles under the powers of the Roads Act, 1920, I have referred to, on routes where there are already established tramway, railless, or motor omnibus services under statutory powers, and in competition with them, are exceedingly sensitive to anything which may threaten an interference with any services which they may suggest have been established by them.

It will also be remembered that a few months ago, when railway companies sought power to run traffic vehicles on highways, a tremendous hubbub was raised by motor transport people in opposition to these proposals. They claimed that they already were carrying out these duties, and that the granting of the necessary authorities to the railway companies would create unnecessary and ruinous competition with untimately great disadvantages to traders and the general public.

A monopoly may be a term which is not very popular in business circles, but one cannot help observing that the most recent trend in high financial circles is in the direction of the formation of large combines in many industries who claim that they are thus enabled to buy and market their productions at a lower rate. Incidentally, of course, if they obtain a sufficiently wide grasp of the component firms in the trade they may also dictate to some extent the terms. As long, however, as Britain is a free trading country the reaction of importations will prevent unduly high prices being charged.

In statutory undertakings the obligations as to fares and services imposed by Parliament entirely eliminate the possibility of a monopoly of street passenger transport in any form becoming injurious to the travelling public.

Consider the effects of superimposing additional services and competition upon any road which, having regard to the fluctuations of traffic, may be considered as already adequately served. It means that in cases where capital expenditure has had to be met a modified service must be ultimately come to.

If, as would be probable, the competitors would limit their efforts to the period of maximum demand, then it inevitably follows that the ordinary services would be curtailed and the interest and redemption fund upon the original outlay would increase per mile as the mileage decreased. To meet this service of debt the public would require to be charged higher fares, and this action and reaction might go on until it was impossible for a statutory undertaking to continue to operate on a self-supporting basis.

Suppose then it was withdrawn, what now remains ?

The service formed in consequence of the Roads Act, 1920, without any liabilities beyond the payment of a licence duty and Inland Revenue tax for road maintenance, without any obligation with regard to fares or services either special or ordinary, and with no rating assessment beyond that imposed upon depots and offices.

Some people may say, " This is healthy competition, and that the best, most attractive, and most economical form of transport will win in the end." " To the man-in-the-street it is a matter of indifference how he is carried so long as it is rapid, safe, and inexpensive."

I think the last expression touches the whole point. It cannot be inexpensive unless it is a monopoly, safeguarded, however, by definite obligations with regard to services, fares, and public requirements. These are conspicuous by their absence in the vehicles which may ply for hire in terms of the Roads Act.

I carry this point very much farther, and I say that Parliament has undoubtedly, in considering the claims for the establishment of services and their consent in granting these subject to provision, intended that monopolies of transport on the highways under consideration should be formed.

A parallel for this view can be found in other public utilities, such as electricity, water and gas undertakings. In all of these monopolies have been set up by the clear and expressed wish of Parliament, and no overlapping or competition is permitted with them in the slightest degree.

It seems evident therefore that action must be taken by Parliament to prevent the menace of uneconomical competition and great waste of public expenditure which, I think, is possible to occur now under the powers set up by the Roads Act, 1920.

It is no use waiting until the disastrous financial cataclysm that has become apparent in London and its suburban areas appears in other parts of the country. I do not speak of possibilities ; I speak of actual facts.

In quite a number of towns in the country already services have been set up over tramway routes, and also; in many cases, over railless and omnibus routes which have long been established and are working in virtue of statutory powers.

I do not in the compass of a paper of this length, and directed to a particular and urgent national necessity, propose to discuss the relative merits of tramways, railless or motor omnibus traction. It may be that development in the latter forms will justify the relegation of railed street transit to the limbo of the past as horse tramways and omnibuses have been supplanted by something which better fulfils the public ideals of speed, safety, silence, comfort and cost. If such changes become practicable and justified then they are the natural evolution towards which the statutory authorities operating the present lines will gradually tend. Great keenness in the examination, testing, and discussing of improved forms of transport has always been a feature of tramwaymen, and they may safely be trusted to continue to provide this.

The present peril is not directed against tramways *per se*, but against municipalities and private companies who operate under statutory powers tramways or omnibus services on routes which they have established very often at great cost.

It is therefore of the utmost moment that the members of this Association, who are responsible for the carrying on of these great undertakings, upon the maintenance of which much of the comfort and prosperity of the country depends, should make their undoubted power in Parliament felt so as to more clearly define their rights and privileges obtained after full examination by Committees of both Houses of Parliament and by Parliament itself.

DISCUSSION.

The President.—Before we proceed to discuss Mr. Hamilton's paper, I want to say that this subject is considered to be of such great importance that it is suggested a resolution be moved and seconded. The discussion could then range round the paper and this particular resolution. Mr. Hamilton has a resolution which he will move and probably some other member will second.

Mr. Hamilton.—The question is whether this resolution should be moved at the beginning or not. I did not include it in the paper, but the Executive Council, who particularly asked me to prepare this paper, think I ought to have given it at the beginning, subject to such modifications as you may want. The resolution is—

" That in the opinion of this Association the competition of motor vehicles with tramways upon inequable terms relating to—

1.—Local taxation ;
2.—Road maintenance charges ;
3.—Statutory fares for ordinary passengers and workmen ; and
4.—Regularity of service,

will result in further increases in tramway costs and consequential fares, and that therefore representations be made to the Ministry of Transport urging the statutory regulation of such competition in the public interest. "

The position is this. I have been very busy and it was necessary that Mr. McElroy's paper should be seen before I prepared mine, because we were following on parallel lines, and I thought perhaps I might be able to compress what I had to say in the form of remarks. You will observe from the paper that I bring you to a certain point, and do not indicate a remedy. This resolution, to some extent, indicates the form which the Executive Council think the remedy ought to take. I hope the discussion will be free and fair. I am bound to say that none of us want motor omnibuses to go off the roads altogether ; we simply do not want them to interfere where we have established tramways. They have a large field of usefulness in serving those wider districts to which it has been impossible to extend the tramways. The question is should they run perfectly untrammelled without any conditions at all, or should they have condition imposed upon them ? The Executive Council have thought that the right way at the present stage is to organise a big campaign dealing with the matter ; if this be done, I have no doubt as to what the result would be. The appropriate department will have to take the necessary action, but we shall have to guide them as to what is the appropriate action. The first step should be in the direction indicated in this resolution—that services coming under the 1920 Act should be liable with regard to fares and with regard to the class of fares for different classes of riders, and should be liable to obligations to which they ought to conform.

Mr. T. B. Goodyer (general manager, Croydon Corporation Tramways).—I have much pleasure in seconding the resolution.

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Mr. H. Mozley (general manager, Burnley Corporation Tramways).—I should like to support the resolution and suggest an addition that municipal tramway undertakings, as well as companies, should be put in as favourable a position as private owners of motor omnibuses in regard to their use. They should have just the same power, and I think if it is not added to this resolution, it should be embodied in a second resolution. I told you to obtain those powers twenty-one years ago and you neglected my advice.

Alderman C. Higham (chairman, Blackburn Tramways Committee.)—I should like to speak in support of the resolution—and I do so as the representative of a small unkertaking—because I think the present chaotic state that allows what I call chaotic competition is a very great danger, especially to small undertakings. We live—when I say "we" I mean the small undertakings—or rather we just exist by being able to take advantage of the rush times. Many representatives of small undertakings will realise, as I realise, that throughout certain days of the week, or rather throughout hours of certain days of the week, we are running the whole time at a loss. Every mile we run during those hours on those days is run at a loss, and the only chance we have of keeping our tramways from being a permanent burden upon the rates is at those hours when there is a rush of traffic—meal hours, the evening, and so on. Now during some of the hours when it is possible to make our tramways pay their way, or gain a little to pay for those many thousands of miles that we have to run at a loss, the Government puts upon us the necessity of running at what they call workmen's fares; and it is very difficult, unless you throw open your cars to the whole of the public and make everybody workmen, to pick out the workmen and see that it is only workmen who take advantage of those fares. Many tramways—most of them, I think—find it imperative that during the time they have to run at workmen's fares they must carry everybody as workmen, and at the present time—I know there are some who would disagree with me—most of the small undertakings, at any rate, during the time they are running at workmen's fares, do very very well indeed if they pay the cost of running, never mind getting anything towards those many thousands of miles that they have to run at an absolute loss. We all have a cricket team or a football team, and so on, and during the time when those teams are playing is a time when we have a chance of making up a little of the leeway. Under the present—or what is going to be worse competition in the future—when that time comes along, you have a quantity of people who are prepared to fill your cars, but a competitor with a motor char-a-bancs that he has bought, not with the object of serving the public, but with the object only of making money, and picks up the people that you ought to carry to enable you to maintain your service. All of you realise that in every town in the country there are numbers of omnibus proprietors and chars-a-bancs proprietors who are applying for licences, not simply in their own town but in an area some 30, 40, or 50 miles round. I know in our town we have applications from chars-a-bancs proprietors who live, or whose garage is situated, say, 40 or 50 miles from our boundary. Why do they want licences to ply for hire in Blackburn? Simply so that they can come along at a time when it is possible for us to make something to recoup the money we lose in those slack hours I have spoken of, and take loads of passengers that ought to enable us to carry on a public service. They do not come under any regulations as to what they should charge; they vary their fares according to circumstances. If the crowd is big and passengers are plentiful, then they will charge 6d. or perhaps 8d., or even 1s., for a certain journey; but if it comes to competition they will come down to 4d. or 3d. for the same journey. Why? Because they say, "We have got our motor chars-a-bancs on our hands; they have to pay their way," and that is the method in which they are going to make them pay their way. But what is going to be the result? The result will be to drive small undertakings, and eventually perhaps, large undertakings, on to the rates or on to the rates a great deal more than they are at the present time. I am sure we all realise that we have enough difficulties to contend with under the ordinary statutory powers, but if we have to face this unbridled competition, then I say to the man-in-the-street, "It is you who is going to suffer in the long run," because I contend that while the public may bear, for a certain time, the rates going up, they are certainly coming to a point when they will cry "Halt." Even at the present time, the great cry throughout the country is that there must be a halt in the raising of rates, but if you are going to shift all the tramways on to the rates, it will result in either one of two things—rates that will prevent any trade whatever being done in the town, or the abolition of tramways entirely. It is going to make it more profitable for the tramway authorities to keep their cars in the shed than to bring them on the streets and run them. I know one town that has already said their rates have got so high that they would have less to pay if they were to discontinue the tramways service and pay the whole of the sinking fund and capital charges out of rates than if they ran their tramcars as they are at the present time. Again, there is not only this to consider, but that the whole of this heavy vehicular traffic is run on roads that in many instances have not been made for this traffic. What do we find in consequence? All our water mains and gas mains are being shaken to their foundations, and in many instances broken because of the unnatural traffic which is being allowed to run practically untrammelled over roads, whether fit for it or not. As public authorities, that is something we have to bear in mind to a very great extent. The danger does not finish there. Look at any of your small towns or boroughs, or even larger boroughs, at a holiday time when there are great fleets of chars-a-bancs or coaches coming into the towns to ply for hire on long journeys. There is no supervision; there is no authority to examine those vehicles. When they are once licensed there is no supervision whatever to say whether they are fit for the public to travel in or not. Many of them come in from a long journey at 11 or 12 o'clock at night and are out again the following morning at 6 o'clock or earlier for another long journey without overhaul or examination in any shape or form. Therefore, I say, that this resolution is one that ought to be most emphatically supported, not only in the interests of the tramway undertakings of the country, but in the interests of public safety and convenience. I do think that the thanks of this Association are due to Mr. Hamilton for having taken up this subject at such short notice and with such little time to prepare his paper, in order that we might bring the question before the public with the utmost possible weight. Surely, as Mr. Mozley said, we are not asking a great deal when we ask that anyone plying for hire should be subject to the same limitations as ourselves, or that we should be given the same opportunities of making our undertakings pay and trying to keep a public service going, as are given to anyone who can afford to buy a char-a-banc and pay £70 for a licence to run it. Mr. Hamilton's paper is most enlightening. There is one very special fact that I should like to mention, and that is where he shows the annual cost of each tramcar in maintenance. When you compare that with the £70 or £80 paid by the licensee of a motor char-a-banc and consider that he can run in any part of the country where he can get that licence granted, you will agree that it is time a great protest was made, not only by this Association, but by the whole of the public against the most unfair competition that has ever been set up, which I honestly believe will end by running the public service down to such an extent that the use of the tramways will be limited to a very great extent.

Councillor R. L. Berry (Aberdare Tramways Committee).—I should like to thank Mr. Hamilton for the very clear paper he has given us, and I feel that, as a representative of the Aberdare Council, and one interested like yourselves in the success of a tramway undertaking, you should know what occurred at our Council meeting on Monday last in connection with omnibus traffic which desires to run over our routes. Some time ago we had applications from people living some miles out of the district for power to travel over our roads, and we refused. They, under the rights which they have, appealed to the Ministry of Transport, and we had a letter from the Ministry which was read at our meeting on Monday. It was to this effect; they advised us to grant the licence subject to these people not picking up traffic over the roads served by us, so that they would have the right to bring the people in from the places where they intended running into our town, but would have no right to pick up passengers along the routes served by the tramways. I mention that as showing that that is a concession towards the object of this resolution, and I thought I should be wrong in not telling you that the Ministry had gone thus far. Whether we shall be able to enforce it, whether we shall be able to trap them if they pick up fares on our routes as we know they are doing now, or what powers we have to deal with them if they are caught, I cannot inform you; but as it shows a tendency to meet us we shall be quite justified in taking every action to support Mr. Hamilton's resolution which will ensure that clear safeguards shall be made in the way of obligations for the protection of our undertakings. We have a very strong claim for protection, because we have to undertake certain definite obligations, and if we cannot make our undertakings successful we shall have to leave our capital lying on the streets and not be able to shift to another place and try again.

Mr. W. Murray (general manager, Walthamstow Tramways).—I should like to have the pleasure of supporting this resolution and I should like very heartily to congratulate Mr. Hamilton on the excellence of his statement of the case. It is clear, comprehensive, and convincing, and to my mind logical. It is unanswerable, but I should like to refer to a paragraph in his paper where he says—"It is no use waiting until the disastrous financial cataclysm that has become apparent in London and its suburban areas appears in other parts of the country." I want to express regret that Mr. Hamilton and his colleagues on the Executive Council were content to wait until this cataclysm fell upon London before taking active steps to stop it. I should like respectfully to submit that if, fifteen or sixteen years ago, the Association had fought our battle, we

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should not have to fight it now on our own account. Had the Association been able to fight it then, when it was in its infancy, it could have done so much more effectively and with much better hope of being successful than we can possibly have to-day. It is to me most regrettable that only now, when the thing is coming home to our own doors, we are becoming alive to the very great danger which exists in this competition. I wish every success to the Council, and hope you will call attention to this very great danger and do something towards wiping it out.

Mr. E. S. Rayner (general manager, Hull Corporation Tramways).—We are to-day, undoubtedly, in the melting pot and in all the conferences I have attended, which I think includes nearly the whole, I have never heard three more appropriate papers discussed. The times for us are critical, and unless action such as is proposed by this resolution is taken we look like going out of existence. There are three things which have come out so far in these discussions. One is the question of wages which will be dealt with later on ; the second is a point mentioned by Mr. Hamilton, that is the cost of road maintenance ; the third point, which is peculiar to Mr. Hamilton's paper, is the unfair competition which we are subjected to under the last Roads Act. If you realise that Parliament has sanctioned the expenditure of enormous sums of public money on tramways, I take it that it is only reasonable for us to expect that Parliament will give the people to whom such sanction has been granted legitimate protection for that money after it has been expended. If Parliament had any cause to complain of the way in which our systems have been run, of the way in which the public had been served, and could show that there had been any attempt at taking undue advantage of the monopoly which we have so far enjoyed, then they would have some right and some reason for allowing the unfair competition which at present exists. In Mr. Hamilton's paper there is one sentence which I will read—"In the great majority of systems in the country it was found possible to grant fares at rates which were considerably within the powers as to charges granted by Parliament. In most of the large cities the actual fares charged were not more than 50 per cent. of the rate which could legally have been charged." I do not think you could have a better proof of the good faith and good management of the tramways, and of the wisdom of the powers granted by Parliament to the municipalities throughout the country. It seems to me that the crucial point in connection with the granting of unlimited power to outsiders lies in the fact that the great difference between the powers granted to these people and ourselves is that in our case, if we go for powers, we have to prove the necessity for a service ; we have to prove the inadequacy of any existing service. In no case, however, is a man asked when he proposes to run a few omnibuses whether there already exists an adequate service along that particular route. That to my mind is the crux of the whole thing. Railway companies, in applying for powers, have to prove that there is no adequate service in the district through which they propose to run any new railways. They are in exactly the same category as we are ; they have to prove that there shall be no undue and wasteful competition. Why, I want to know, should irresponsible people be granted the right to compete with us upon unfair terms and rob us of the possibility of providing a reasonably cheap service for the public in our cities ? When all is said and done, the public is represented on the authority which is given the power to run a tramway, and it has powers to insist that the service provided shall be the cheapest possible, so that it shall pay its way. Now this is going to force us into such a position that we shall either have to run a reasonably cheap service for the working people and throw the deficiency on the rates, or else run such an expensive service that it is no use to our workmen. What is more, the people who will have these powers granted to them cannot substitute the service which we shall have to withhold. If they could provide a substitute for this service at the same price that we could provide it, then there would be some reason. It is undoubtedly a very serious point in the life of tramways ; and now, when things are more or less in a fluid state, is the time to take strong action to curtail the operations of these competitors. I think that, as I said before, if these people are asked to prove that there is no adequate service along the routes which they propose to serve, that will be one of the strongest preventatives you can have of competition by unrestricted traffic, which can come in and take the cream of your load. Every paragraph of Mr. Hamilton's paper gives us salient facts and figures to which, as has already been said, there is no answer. There is no excuse for the granting of these unrestricted powers to irresponsible people without imposing on them the same obligations that we ourselves have to face.

Mr. J. R. Groves (general manager, Barrow-in-Furness Corporation Tramways).—I do not wish to go over the ground which has been covered by previous speakers, but one speaker has given a certain amount of information regarding motor omnibus competition. As most of my colleagues are aware I have recently issued a questionnaire to all the members, asking how they had dealt with existing competition within their own boundaries. I have received a number of replies and I shall be pleased to give a complete list to the secretary if you will give him permission to issue them to every member of the Association, and to that I might ask that a copy of the resolution read by Mr. Hamilton should be added.

Mr. H. P. Stokes (general manager, Plymouth Corporation Tramways).—I should like to ask, in connection with this resolution, whether you propose to work in unison with the Tramways and Light Railways Association, because it seems to me that a paragraph in Mr. Hamilton's paper tackles the subject from the point of view that the companies ought also to have the question in front of them. The present peril is against both municipalities and companies working under statutory powers which have invested huge sums of money, and it does seem to me desirable that the assistance of the companies should be obtained so that one complete voice should be used.

Alderman W. C. Fenton (deputy chairman, Sheffield Tramways Committee).—I should like to ask one question before making a few remarks on the excellent paper this afternoon, and that is whether the unfair competition with tramways includes motor omnibuses owned by municipal authorities as well as tramways, i.e., whether the unfair competition referred to in the resolution applies to tramways or to motor omnibuses. I take it that it applies to both although it does not say so.

Mr. Hamilton.—It does say so.

Alderman Fenton.—At any rate, I think that is one aspect of the question which comes very forcibly to some of us. I suppose that with the exception of Birmingham, Sheffield runs more motor omnibuses than any other Corporation in the country. I think I am correct in saying that, and we have at the present time a sample of this unfair competition to which we all object. We have motor omnibuses coming into our district over routes where we have paid many thousands of pounds in Parliamentary expenses to obtain running powers. They have come in without paying anything at all and are running omnibuses at fares which you may call competitive, but are certainly what I may call reckless fares, and with cheap labour. The consequence is that the ordinary omnibuses cannot possibly be run at a profit. It seems to me that that is one aspect of the question which we all have in our minds this afternoon, and which should be dealt with very promptly. It seems to me absolutely, on the face of it, a gross injustice that when a Corporation or company has obtained powers to run motor omnibuses or tramways at great expense, others should be allowed to come in and compete with us on such unfair terms, especially over the routes for which the municipality or company has paid such a large sum in Parliamentary and other expenses. Mr. Hamilton quotes Clause 14 of the Roads Act of 1920, which gives power to people to appeal to the Minister of Transport in case licences are withheld or are granted with certain conditions. That is a most unjust arrangement. It is one of those things which ought to be in the hands of local authorities. The experience of the war, I think you will all agree, has taught us that the less of bureaucracy in London the better ; and this very clause is a sample of the limpets in office trying to keep the power in London which ought to belong to intelligent municipalities. This is one of the clauses which we shall have to attack and try to get repealed, if we are going to have justice done to the municipalities of the country. There is no question about it that the local authorities know better than the people in London whether competition should be instituted in the district or not. The municipalities are out for the interests of the people who live there. The people in London think nothing at all about that ; we have sufficient experience of that, and to my mind this clause is most unfair and unjust, and we should do all we can to get it amended in the direction I have indicated. I am sure we are all very much obliged to Mr. Hamilton for the paper. It has given us plenty of food for thought, and I join with those who have congratulated him on it. There is no doubt that we shall have the opportunity of urging upon the Executive Council the necessity of taking action during the coming year.

The President.—It is not our intention to take a vote this afternoon. We propose to resume the discussion to-morrow morning and then take the vote.

Councillor H. Brooks, J.P. (chairman, Blackpool Tramways Committee).—I would like to suggest that a copy of the resolution be sent to the Association of Municipal Corporations for their co-operation and sympathy. I think it would do a great deal of good.

The Secretary.—No doubt, when we pass the resolution, we shall decide to whom to send it—probably to the Tramways and Light Railways Association as well as the Association you mention.

The conference then adjourned until Thursday morning.

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THURSDAY MORNING SESSION.

The President again occupied the chair on Thursday morning, when the discussion on Mr. Hamilton's paper was resumed. In opening the proceedings, he said—I will first call on Mr. Hamilton, as he wishes to add a little to his remarks of yesterday.

Mr. Hamilton.—The resolution which I had the pleasure of reading to you yesterday has been the subject of consideration by your Executive Council since last night. Some of them have been sleeping on it, and the consequence is that this morning the resolution is to be put before you in a different form. Before we begin, I hope there will be a free and full discussion on the matter. I wish to say to you that we have felt the resolution of yesterday is a little too narrow. It bases our case upon unfair competition alone. Now, I wrote the paper under the general guidance of our legal adviser, that is to say, with regard to the law, and his view, like that which I expressed to you, is that the Roads Act, in its operation, if carried out literally, is against and contrary to the intention of Parliament, and that we, who had to fight tooth and nail in many cases against road authorities —sometimes against stupid local authorities— in our extension schemes, understood when they were granted to us, they provided a monopoly of road passenger service, at any rate, in that section of the country. If that is so, and I think it is, we ought to have a resolution embracing it, and therefore the resolution which we are going to put to you will be one which will place our position, I hope, on broader lines, on more general terms, than the resolution of yesterday. It will enable us to carry weight, I hope, not as a municipal tramways association, but as representing the whole country, because this is not a matter for municipal tramways alone. It is as much a question for the general travelling public, and, in fact, a great deal more a question of theirs than ours, as undertakers. We are merely servants of the people; but, being students of the subject, we are able to direct their attention to what is going to affect them. We want it realised throughout the length and breadth of the land that this is a necessary thing to do, and that if they do not do it, they will interfere with the privileges granted by Parliament, upon which a great deal of public money has been spent. Therefore we should like to take up the first position, namely, that it is contrary to the spirit of Parliament; secondly, that it would be wasteful; and, as clearly stated yesterday, it is most unfair to the public forms of transport we have to carry on. We see in the press this morning a statement which I hope those speaking to-day will absolutely nail to the table as being imporper and absolutely incorrect. It states that tramways have passed away. It means that if we say, "Here is unfair competition which should not be imposed upon us," that our usefulness, our day of service, has passed away. It is not so. I do not know what you gentlemen think, but I personally—and I see a great many tramways in the course of the year up and down the length and breadth of the kingdom—do say that the tramway, for urban services, for density of population, is unequalled, and to my mind will be unequalled for many years to come, in regard to the service they can give at low fares and costs. There is no other service to compare with it, and I hope that we shall put that right in the press to-day. I thought it would not be imposing too much on your good nature if I stated how we are going to broaden the resolution. All lawyers say you ought to take in every possible point that you are going to raise, and there are quite a number I have not referred to; but these can be dealt with equally well if we have a good, broad general proposition to put forward and get the assistance, not only of the Association, but of all the members in their individual and local spheres.

The President.—This is the resolution which has been drafted and is subject to any alteration of words or conditions you may wish to make—

> "That in the opinion of this Association, representing the whole of the municipal tramways of Great Britain, the Roads Act of 1920 encourages wasteful and overlapping competition with statutory undertakings, which will inevitably result in increased travelling charges to the public, and is contrary to the intentions of Parliament, and that, therefore, representation be made at once to the Minister of Transport urging the statutory regulation of such competition in the public interest."

That is the resolution which it is suggested we substitute for the one put forward yesterday. Mr. Hamilton now moves it formally. Will anybody second it?

Mr. A. L. C. Fell (general manager, London County Council Tramways).—I have much pleasure in seconding it formally.

The President.—The resolution and the subject of the paper are now open for discussion.

Councillor E. Lee (chairman, St. Annes-on-Sea Tramways Committee).—I rise with a certain amount of trepidation, because I speak on behalf of the youngest member of this Association. I want at once to say that in my judgment, speaking as a mere amateur on these tramway matters, I think this resolution is very much better than the one read yesterday. It certainly covers the case very much better so far as St. Annes is concerned. But I do, very respectfully, wish to offer a little criticism of the action of this Association, although this is my first appearance here. It appears to me absolutely incredible that this august body has not exerted itself to the utmost of its power, for, if it had done so, the Roads Act would never have passed through Parliament in the form it did. I am glad the resolution mentions our opinion that the Roads Act was contrary to the intention of Parliament, for I am quite certain that no Member of Parliament, and certainly no constituency, would ever willingly place such absolute power as we find in the Roads Act in any one man, place it above the High Court of the country, even above Parliament and above the King. Dealing more specifically with this resolution, it is not many months since we spent a large sum of money on taking over the undertaking of a private company, to run its cars from Blackpool to Lytham, and even at this early date we find that no less than 500 chars-a-bancs journeys a week are running from Blackpool to Lytham and back, mostly in competition with our tramways. We hold, being good Lancashire men, that free competition is good for everybody, but it wants to be fair competition. Now, the chars-a-bancs I refer to are not run at regular intervals—sometimes they run at intervals of 1¼ minutes, and then for hours there is not one at all; sometimes the charge is 1s. and sometimes 2s. 6d. We say that it is most unfair, and I am very glad that this resolution has been put before the meeting. I was pleased to hear the representative from Aberdare say that the Ministry had turned down an application by some chars-a-bancs people or omnibus people to ply for hire within their area. We had a similar application some three months ago. We went to the Ministry of Transport, but in the end they sent an inspector down to the district to make inquiries, and he left us with the impression that it was quite possible that the Minister—despite all we had said, despite the fact that we had pointed out that our tramways undoubtedly at present covered the requirements of the public convenience, and that in our own Bill we had power to run motor omnibuses at any time we thought the public convenience demanded—might give this power to this outside company. This outside company came from Preston and wished to ply for hire in our district; yet it was quite possible that the Minister would grant such power, despite all we had said. I have very great pleasure in supporting this resolution.

The Secretary.—Would you mind telling us what the ultimate issue of your relations with the Ministry has been, because it is perfectly obvious that very much will depend on the basis of their first decision?

Councillor Lee.—I apologise. The reason I was glad to hear from the representative from Aberdare what had occurred there was that we have not yet heard officially what is going to happen to ourselves. If they turned it down there, probably they will also turn it down at St. Annes.

Alderman D. J. Davis, J.P. (Mayor of West Ham).—I understood my friend from Aberdare to say that the Ministry had written again asking them to reconsider the matter, so that it is not quite correct to say that the Ministry turned it down.

The President.—Perhaps the gentleman from Aberdare will say again what the decision of the Ministry was in that case. They suggested restrictions, I think.

Councillor Berry (Aberdare).—The Ministry suggested that the chars-a-bancs should not be allowed to pick up traffic on our tramway route, but they could bring it in from outside the town to Aberdare.

Mr. L. C. F. Bellamy (general manager, St. Helens Corporation Tramways).—In one paragraph of Mr. Hamilton's paper he says—"Powers were granted to public authorities in many cases to utilise these vehicles for traffic in less populated districts, but in all cases during the last eight or nine years a charge for road adaptation and for maintenance of the highways thereafter was imposed." I can only attribute to Mr. Hamilton's innate modesty the fact that he has not told us more on this vexed question of adaptation. In our Bill before the last session of Parliament Mr. Hamilton made a terrific fight for all of us—albeit it was paid for by the St. Helens Corporation—to establish the principle that no motor omnibus proprietors, be they municipal or private, should pay more towards road expenses than the annual excise licence. Yet a clause was inserted in our Bill putting upon us an obligation to pay an unknown contribution towards adaptation of any road outside the borough over which we might run, and a like clause has been inserted in all similar Bills subsequent to ours. I am not prepared to say whether the roads in our case do or do not require adapting, but I do say most emphatically that the effect of this legislation is an invitation to the Lancashire County Council to remake the roads in their area

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over which we sought powers to run, and to get from us as much as possible. During the hearing of our Bill by the Local Legislation Committee in the House of Commons, both Mr. Hamilton and our counsel, Mr. Jeeves, advised us to drop our motor omnibus proposals if we were to be let in for adaptation charges. When the Roads Act and Finance Act of 1920 were conceived, it was undoubtedly the intention of Parliament that comparable conditions should be imposed on all road users, and I am very glad indeed to hear the resolution that has been moved by Mr. Hamilton. I do not suppose there are half a dozen municipal motor omnibus concerns in this country which can show a genuine profit, and whilst we had every hope of making ends meet on the two principal routes which we had in the Bill, I am afraid the position will be hopeless if we are to be mulcted in adaptation charges. Another point I would like to mention is that one-third of our tramway system is outside our borough boundary, and in our Bill we sought powers to operate omnibuses over these routes. This, however, was—for some inexplicable reason—turned down, and we are not permitted to run over roads where, by virtue of our maintaining more than (on the average) half the total width, we ought strictly to be the joint highway authority.

Mr. C. Clarke (general manager, Birkenhead Corporation Tramways).—I think it is very important that the Association should have before them a full record of what the Ministry of Transport has done in regard to this matter, and although I would much rather not have had my particular case put into the papers, still I think it is more important that the Association should know what is happening. When we were before the Ministry of Transport, first of all, in regard to this particular matter, our case was this. We had a tramway running 2½ miles from the centre towards a certain village. In 1914 we went to Parliament for motor omnibus powers, and we asked also for powers to run to this village, about another 2½ miles beyond the tramway terminus. That meant running outside our own borough into the county area. We got the powers, with certain limitations, and we opened our omnibus service. The omnibus service started from about the centre of the system and not from the point where the tramway starts, ran over and beyond a portion of the tramway, and then on to this particular village. Later, a company started operations, and they applied to the county for permission to run over a portion of our route up to the borough boundary. They got that permission from the county and started to run their service as far as our boundary. They then applied for permission to run over a fresh portion of our omnibus route to the tramway terminus, but the Corporation refused licences. That was twelve months ago. They appealed to the Ministry of Transport, and there was an inquiry in London at which we both appeared. We were waiting for the decision of the Ministry, which came about a month afterwards, but in the meantime the company were too anxious to wait for the decision of the Ministry, and they started to run to the terminus, discharging their passengers within the borough and running empty back to the boundary line, which was about a quarter of a mile from the tramway terminus, asking their passengers to walk the distance between the tramway and the boundary. Needless to say, they did not do very much, but they had already started that action when the decision came along. It was not a decision; but it was to this effect, that the Ministry thought this was a case where amicable arrangements ought to be arrived at between the Corporation and the company. We replied to that letter that the company had not had the good grace to wait for the decision of the Ministry; that they were running into the borough illegally, as we thought; and we refused to have any further dealings with them. We have not heard anything further since. The company is still running to our tramway terminus to discharge passengers, and still running empty back to the boundary. They are doing us little damage perhaps, but still they are running over the route to this village outside the boundary where we have statutory powers. I thought that case ought to be stated to the conference, so that they would have a full record, as far as possible, of all that the Ministry has done in regard to this matter.

Alderman E. H. Sellers, J.P. (chairman, Huddersfield Tramways Committee).—It might interest the conference to know how Huddersfield has dealt with a case similar to that which has just been named. Some two years ago we spent thousands of pounds in going to Parliament and getting powers to run omnibus services into certain districts. In two of these districts we are now running omnibus services, but as soon as we got these powers one private individual set up an omnibus service. The way he does it is that he waits at the terminus until he gets a load and then goes forward. That is the method, I take it, that is being followed in several other cases, but in another case we had a man who ran an omnibus service, or tried to run it, in opposition to ourselves. In this particular case the man just got on the boundary, and was quite within his rights; he filled up his char-a-bancs and away he went in opposition to our omnibuses. Now, the way our manager tackled that was that he went to this man and said, "If you do not go away and leave us to our rights, I shall put a service on and run you off the road. If you won't be run off the road in a fair manner, I shall run you off by making a penny fare." This frightened the man and he has gone off the road and left this particular route to ourselves. I do think, Mr. Chairman, that seeing that our Corporation has had to go to Parliament and spend thousands of pounds, it should really have some advantage for so doing. There is one specific case I might mention. We have powers to extend from Huddersfield to Brighouse. If we made that extension of the tramways it would cost us at least £120,000. We can buy a lot of omnibuses for that sum. In addition to the cost of making this tramway which we would incur, the Brighouse people would have to do much road widening, which, of course, would be to their own advantage. But I do say it is not equitable that we, as a tramway undertaking—as a Corporation rather—should have to pay all these expenses, and that a private individual can come in and, as has been stated, either run his omnibuses or chars-a-bancs every 1½ minutes, or at intervals of several hours. I say it is most unfair, and I hope that this resolution will go forward with all the weight we can put upon it.

Alderman R. Mayne (chairman, Newcastle-on-Tyne Tramways Committee).—We must give consideration to the effect which this is going to have upon our revenue and results; yet, if we want to get public support, without which nothing can be done, we have got to take a bigger view. We have to let the public realise that their opportunities of getting a service are to be greatly diminished. After all, we, as municipal tramway authorities, run our tramways as a public utility. The great danger of the present position that I see is that public authorities—I do not mean tramways committees, but public authorities, Councils, Urban District Councils, and others—are losing that control over the service which they ought to have. If it is left to them as it has been for some years, to have the right to say whether or not any particular service shall operate over their roads, they will be able, before granting that privilege, to demand a certain service at certain periods; a regular service, not one that comes out when there is money to be made, but as a public utility. We run our trams at times and in districts that do not pay—and the loss is made up by the districts that do pay—for the general service of the inhabitants of the area, and if the public can only realise that they are to be left to a haphazard method of carrying them, rather than to a well regulated method, I think we shall succeed in getting public support brought to bear upon Parliament in a better way than by the croakings and fears of the people whose revenue is going to be affected.

Councillor I. F. Akeroyd (deputy-chairman, Bradford Tramways Committee).—I would like to ask Mr. Hamilton, in his reply, to give his ideas about the following points. For instance, from Pateley Bridge to Otley there is an omnibus service which switches on to the Leeds section. There are about four miles where there are no omnibuses or trams running whatever, but when it gets to Menston, then it goes along the East Lancashire section. There is also another from Otley to Horsforth. In Bradford we have nothing of that sort, with the exception that we have 40 or 50 chars-a-bancs plying for hire every day, and these chars-a-bancs, although running over our tram track, only take passengers for long journeys of 20 or 30 miles. I do not know what Mr. Hamilton's idea is of that kind of running and what he intends to do with it, but I suppose that will happen in every town.

Councillor A. Digby Willoughby (chairman, Hull Tramways Committee).—I must congratulate the Association on the proposed change in the resolution. In the main, I must say that I support it, but I would like to offer one or two criticisms. Yesterday in this hall we listened to some very pessimistic speeches in regard to the future of tramway undertakings. We were told that if this competition persisted the tramway undertakings would in many cases become bankrupt. Probably one might agree that a small percentage would arrive at a very undesirable position, but I think we may say in the main that in the course of the next few years tramway undertakings will recover. We are only, in my opinion, in the same position as any other great industry in this country at the present moment. We are facing a tremendous slump, and we do not want to be pessimists over this question. In my own city we are not equally pessimistic in regard to the tramway outlook in the future. We are only facing a great fall in values, but we in this hall are rather putting the blame on the motor char-a-bancs for this fall. (Cries of "No.") Well, that is my opinion. I rather think, gentlemen, we shall find when we look back at the situation in seven years' time that we have arrived at an evolution in transport, and this is merely one of the passing difficulties. You look at it to-day purely from the Corporations' vested-interest point of view, and I think if we were autocrats to-day on this question, at least 80 per cent. of us would rule out the chars-a-bancs competition, the competition that we have to face. I think it is only fair that we should look at it from the statutory point of view of the Ministry of Transport. The difficulties that we have to face in dealing with this question

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are not very simple ones, because if we have to deal with the same conditions and make the same type of inquiry that we are asked to face when we ask for extensions, and have to give certain guarantees, I think we should find that preventing this competition would have a tendency to impede transport. I think there is another point of view to which we have not, perhaps, given expression here to-day, and that is that it is imperative, as far as the community is concerned, to a very large extent, that other means should be given. In this room yesterday utterance was given to a certain thought, that it was undesirable when you had to carry great crowds of people, for instance, to a football match, that outsiders should come in and make money. Very few tramway undertakings are capable of dealing with the large number of persons that would have to be moved on such an occasion, and to my mind it is a very good thing that, in our city, we have chars-a-bancs to move the passengers. We cannot deal with them, and as far as I am concerned I rather welcome the chars-a-bancs in the city. We have allowed unrestricted competition with the trams by the chars-a-bancs people, and I must say that in the main it does not at all affect the tramway undertaking.

Mr. W. T. Young (general manager, Dundee Corporation Tramways).—While agreeing in the main with Mr. Hamilton's resolution, there is one little point which I do not think it covers, and that is the competition of traffic outside the areas. It is principally confined to omnibus competition, or company competition, with the tramways inside the city areas. It is common to most of us, on account of the tremendous housing shortage in the cities proper, that a great number of the population who work in the cities are going to the nearest neighbouring villages and residing there. We, in Dundee, applied to Parliament for a Bill to enable us to run our omnibuses outside the city area. That was applied for last September, and in the intervening time between then and July, when the Bill was dealt with in Committee, in came a competitive syndicate company, and they ran over every one of the routes that we had thought of, and had stipulated in our Provisional Order, with the result that when we came before the Parliamentary Committee, this syndicate appeared as objectors, on account of the fact that services were already in operation. Needless to say, we were unfortunate in losing that Bill. What I want to impress upon this meeting is the fact that if we are to go in and apply for a legislative measure, we want to have one sufficiently comprehensive to include the traffic, both inside and outside our cities, which is competitive. As far as the Minister of Transport is concerned, he gave his ruling on our Bill and a recommendation to the Committee, and in that he stated that he would recommend to the Committee that Corporations should get powers under the Model Clauses Act, 1920, and that Model Clauses Act permits Corporations to run outside their borough boundaries, subject to the permission of the Minister of Transport. Irrespective of that recommendation, what did the Committee do? They said there was no precedent in Scotland, and that is how we lost our Bill, irrespective again of the fact that we were able to show them seven cases in England where these particular powers had been granted outside the borough. We lost our Bill on account of the fact that we had no previous precedent in Scotland, and therefore I have come to the opinion that through the Model Clauses Act no Corporation in Scotland will be permitted to run outside the borough boundary. If Mr. Hamilton would not object, I would propose that after the words " statutory regulation " in the resolution, we put in " of motor vehicle traffic by competitive Corporations and companies either inside or outside the city areas."

Mr. W. Murray (general manager, Walthamstow Council Tramways).—I hope, for their own sakes, that our friends from the provinces will not make the mistake of under-estimating the danger of this competition, because I can assure you that although some have heard of what is happening in London, even they cannot completely realise the conditions which exist there. Just imagine any tramways undertaking, fairly successful, being met by a competing company running over the routes, and dividing the traffic with them, and what the financial result would be. But it is worse than that. I know of a municipal undertaking which lately felt compelled, because of their own financial difficulties, to raise fares and establish a higher minimum fare. The omnibuses elsewhere had been in the same position and had raised their fares to the 1½d. minimum fare, yet in this locality where they were competing with the tramways undertaking they did not raise their fare, but left it at a penny. They were approached, but stated they could not see their way to raise their minimum. The result is a wonderful object lesson of the attitude of the company. If you go a certain distance on their omnibuses and pay a fare for the whole of the distance you intend to travel, you get three tickets. You get one ticket, a dear ticket, where they are not running in competition with the tramways; you get a second one where they are competing with the tramways, a cheap ticket; and then a third when you clear the tramway district, and they again raise their fares. You have first a high fare, where they have no tramway competition, then a low fare when competing with the tramways, and again a high fare immediately they leave the town. Do you see the position? Where will you be if they come into one of your provincial towns and divide the traffic with you? Can you carry on if you lose half of your traffic? That is the danger you have to face, and the influence behind these combines—because, after all, those holding the shares of many of these companies are the same persons—is greater than anyone can imagine. I know of one authority that went to the Ministry of Transport and sought power to run a trackless-trolley omnibus to a new housing scheme which was being carried out. Do you know what the advice of the Minister was? He said—" There is no need for you to run that trackless-trolley omnibus there; approach the omnibus company and ask them to run a service." There the matter rests. The municipal authority could not get power to extend their own services, but were advised to apply to a competing company and ask them to carry on and meet the needs. If you are going to do any good in this matter it must not be a sparring match or you will get nothing done. It has to be a fight to the finish, and while I hesitate to suggest any amendment to the considered resolution of the Executive, I want the meeting to have an opportunity of considering additional words which will strengthen the position. I would suggest that after the words " will inevitably result in increased travelling charges to the public," the words " prove ruinous to the tramways industry, and finally result in imposing intolerable financial burdens on tramway-owning municipal authorities," should be added. I have a reason for that last sentence. As you know, one, at least, of the municipal authorities has refused to levy the rate in order to meet its financial responsibilities, and it has put the Government in a most awkward position; there is a talk of other authorities following that example, but the Government does not want this trouble to increase. They fear it; but unless you can throw out something of that kind to make them pause, you will accomplish nothing whatever, and I suggest that might have a sting which would touch them where ordinary phrasing might not.

The President.—It is twenty minutes to twelve now. We are supposed to get through another paper and to adjourn by 12.30, so I hope the speakers will not deal at too great length with the points they raise.

Councillor W. J. Squires, J.P. (chairman, London County Council Highways Committee).—I desire to support what I call the amended resolution placed before the conference this morning. I should like also, in passing, to offer my congratulations to Mr. Hamilton for his most excellent paper on what I consider the most contentious matter we have at the present day. I have said in other places that there is room for both tramways and motor omnibuses, but since I made that statement another form of locomotion has been introduced—I mean what many members have dwelt upon to-day, the motor char-a-bancs. The railways are coming into their own, and through the action which they are now taking, in my humble judgment, motor chars-a-bancs will have to stand aside very soon. But whether that be so or not, I contend that no form of transit or transport which is going to compete with municipal tramways should be permitted to operate until it conforms to the regulations and conditions which are placed upon us. (Hear, hear.) It seems to me that the only remedy we have is the one which the resolution will embrace, and that is, going to Parliament for it. It is common knowledge that the London County Council went for a Bill for motor omnibuses to supplement their tramways, for more reasons than one. The strongest reason I can offer is this, that we were most anxious, if we could, to avoid the tremendous expense of laying down tramway tracks if motor omnibuses would serve. We had three or four days at an inquiry at the House of Commons, and what was the result? We got nothing; nothing at all, and that is the position. And until we do something on the lines of this resolution I do not see how we are going to get redress. I am quite sure of this, that all municipal tramway undertakings have a great deal of hard work before them. I am not pessimistic. I have not forgotten, and I hope no one here has forgotten, the five or six years that we have had to go through, which has put our undertakings in the position they are. It is because we are coming out of that trouble that other forms of locomotion think there is an opportunity for them to step in and take something. I regret to say that motor chars-a-bancs up to the present have been enabled to carry many more people than ever was anticipated, but I also am a little relieved when I say that so far as the London area is concerned they are coming somewhat to a slump. I do not want to go back on the shortcomings of the Executive Council of this Association; I am not one of those to dwell too much on the past. I would rather be up and doing and see what can be done in the future for all concerned. I do earnestly hope that the resolution, as amended and presented this morning, may be carried unanimously. We shall look to the Executive Council of this Association to put that resolution in action, and I think if they buckle up their armour some good result will follow.

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Mr. J. S. D. Moffet (general manager, Belfast Corporation Tramways).—I am quite in accord with the resolution; I think it is a very necessary one, and I hope the meeting will whole-heartedly support it. I was also very glad to hear Mr. Hamilton, Mr. Mayne, and another gentleman emphasise the fact that this Association is not afraid of fair competition. What we are up against is unregulated, irresponsible, free-lance competition, something like the "jitneys" in America. Given fair competition, I am sure there is no motor vehicle to hold its own in the conditions under which we have to operate in the provinces. There is no comparison between the Metropolitan area and the provinces. In the first place, the roads are right up against the motor chars-a-bancs in the provinces, the design of the vehicle is against itself, and the huge crowds you have to contend with must be carried and catered for on light railway lines. What we are all anticipating shortly—many of us, at any rate—is that we shall have to tackle this rush hour traffic, which cannot be touched by motor omnibuses or chars-a-bancs, by trailer cars or two-car operation. Touching on the Metropolitan area again, the provinces must remember it is the only place in the world where competition, or motor omnibus traffic, if you like, is subsidised, unwittingly, perhaps, and unwillingly, by the State and by local government. You have there four or five square miles, with a teeming population, untapped by anything but the motor omnibuses and underground railways. Such conditions do not exist anywhere else in the world. The provinces have nothing like such a problem to tackle. I quite agree that some action should be taken to stop, as I have said before, this free-lance competition, but I would not like it to go out from this Association that we, as tramway undertakings, are afraid of reasonable and fair competition; otherwise we shall be condemning ourselves.

Councillor W. T. Newling (vice-chairman, East Ham Tramways Committee).—I am quite sure the Metropolitan boroughs and the London County Council will whole-heartedly support both this paper and the resolution. In fact, to be frank, I think most of us who are sitting here listening to the representatives from various parts of the country expressing their opinions, feel that they rather glory in our tribulations. For many years the Metropolitan boroughs have suffered most acutely under a very unfair competition. With regard to rivalry, I do not believe any of them would grumble at that, but when it is absolutely unfair, unjust, and inequitable, it is time that a protest should be made. You gentlemen have not conditions similar to those in the Metropolitan boroughs. Take East Ham, for example. There are a dozen different services running through the borough all the time, taking a huge amount of revenue away from our system every day, and inflicting a heavy toll on the rates. A poor borough struggling to pay its way will have to bear a heavy deficit year after year, because something to the tune of £130,000 per annum is being taken out of the borough by unfair competition. We think the very best way to bring home this matter to you is for you to have a taste of it. You seem to have had a taste of it, a very small taste, judging from the arguments used in different parts of the hall; and I do not think that the amendment or the addition suggested by my friend Mr. Murray is any too drastic. Something of a drastic nature is required in this resolution to bring the position home to the Government. They will not move otherwise. Something has got to be done; just a pious ordinarily worded resolution I do not think will be sufficient. Something of a very definite and drastic nature must be done to bring home to those gentlemen that more fair and healthy conditions of competition should exist with reference to the transport amd conveyance of passengers in the Metropolitan boroughs.

A Speaker.—Will the Executive accept Mr. Murray's resolution?

The President.—It has not been seconded.

Alderman G. New (chairman, Sunderland Tramways Committee).—I second it.

Councillor J. Crabtree (chairman, Keighley Tramways Committee).—This is my first visit here. I have only been chairman of our tramways committee for a few months and must not take up too much of your time, but I should like to add our case. We have not been troubled a great deal, up to now, with competition from the ordinary chars-a-bancs. You may be aware that we run omnibuses for some four or five miles out of Keighley into the country districts. This summer the chars-a-bancs did come out at rush times, and they have been known to come right within the borders of the town and pick up passengers. We got to know about it and cured it by telling them that they were running the risk of losing their licences. They took the hint and went off, so that we were getting along as we thought very nicely. Last week, at the tramways committee meeting, we had a letter from one of the principal companies in the town asking permission to run chars-a-bancs on one of our routes. This came before the tramways committee last Wednesday, and we instructed our manager to refuse them permission. Before I came here, we received a reply to this effect—"In reply to your letter, we note your refusal to give your permission to run, but we may tell you that you cannot give that refusal. We shall put our chars-a-bancs on the road. We only asked you out of courtesy. Now you refuse it, we shall put them on the road and enter into competition with you." I disagree with the delegate who said this competition ought to be allowed. This might be so in the case of the large towns which have not yet seriously felt such competition, but what about the smaller concerns? If we allow them to run on our routes we might as well take our omnibuses off.

Mr. A. L. C. Fell (general manager, London County Council Tramways).—I do not want to detain you except to emphasise what Mr. Squires has said—that we want London to be taken as an awful example. We have been, so far, ploughing a lonely furrow, and we have had to go before all sorts of Commissions and Committees to try to stop this really wasteful competition which goes on in London. But we have had very little support. When I tell you that to-day we still have something over 700 omnibuses competing directly with us on our routes, simply robbing us of traffic which we could carry, you can imagine the situation is pretty serious. The competition is not getting worse; we are holding our own. But we should be better able to bear all the burdens put upon us if we were not robbed to the extent we are to-day. Think that in London we have had to pay on the tramways £820,000 for widening streets over which the omnibuses run, and then in addition to that we are paying on permanent way rates to the extent of £140,000 per annum! The omnibuses pay nil. It is simply a scandalous position which has to come to an end, but we have found that simply approaching Parliament is absolutely useless. Last year we went to Parliament to ask for very limited powers to enable us to run omnibuses to extend our traffic from dead-end terminals because we found that we could not get the money to extend the tramways. We asked for omnibuses. We went to Parliament and the reply we got was—"Here is a private company; it is true that it is absolutely an irresponsible body, but still we think, as they are there, they should be asked to do this before giving you powers at all." The consequence is that the omnibus company has practically a roving commission to rob us when they think fit. The situation is so serious that I am sure every one of you will put your backs into it and try to get your members interested because I think that a copy of this resolution ought to be sent to every Member of Parliament in the country, in order that he may realise what the position is. If he does not see that we get justice, he ought to get the sack. I will just read one paragraph out of a report of the Select Committee on Transport in the Metropolitan Area, in which it was said—

> "Your committee further consider that it is essential that there should be equal financial treatment of all surface means of locomotion which exist by an appeal to passenger traffic. They regard the rating of the tramways and their contribution towards the maintenance of the surface of the roads as compared with the immunity of the omnibuses from both these charges as indefensible, and there are, in their opinion, no counterbalancing considerations of sufficient magnitude to induce them to modify this view."

I think that is also our view.

The President.—The Mayor of West Ham wishes to say a few words. With your permission I will ask him to do so, and then I shall have to ask Mr. Hamilton whether he accepts the amendment suggested by Mr. Murray.

Alderman G. J. Davis, J.P. (Mayor of West Ham).—I hope Mr. Hamilton will accept the words suggested by Mr. Murray. This matter is much more serious than some of us think. Yesterday I heard something about our wanting more efficient men in the tramway services, and also the question was considered of what salaries ought to be paid. I am not a pessimist usually, but I want to suggest to the gentlemen here, whilst you have the competition that you have to-day—and I am speaking now chiefly of London, Greater London, particularly—it does not matter how efficient your men may be on the cars, and it will not matter very much whether they are paid high salaries or not, there is a danger of trams being run off the roads. Of course, you take that phrase "fair competition." What does it mean? Assume I am a private individual believing in private motors. I have a few thousand pounds I want to invest somewhere and I favour a fleet of motor omnibuses. I am a human being, and human nature, generally speaking, at its worst particularly, is very selfish. Do you think I care a hang how much money the local authority has invested in their system? I want my dividend although I may not say it in plain language. I may not say to the shareholders—"To Timbuctoo with the local authority, I want my 10 or 15 or 20 per cent. Never mind how you do it, run them off." We could tell you tales from London of things that are happening like that every day; it is not a myth. I want to say that the only solution of the whole matter is that the local authorities should have the last word always as to who should run over their routes. With all due respect to the Government, and all due respect to committees connected with the Government, if you get a shareholders list, what do you find? (Laughter.) Municipal

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trading is not yet accepted by the people in general. Some people are compelled to accept it. They hold their positions on public bodies by saying, by word of mouth, that they believe in it, and yet you see that these people are shareholders. Do you think they are going to help you, even if they are on the public body? This is my first visit to your conferences, and perhaps the last. I am not connected with the tramways committee at West Ham, and I want to say to you that I agree with those speakers who have said that the local authority should have the last word as to whether omnibuses should not run in their district. I am sorry I cannot quite agree with Mr. Squires when he says he thinks there is room for omnibuses and trams. I do not believe there is—not to be owned by two different classes of people. If the omnibuses and trams are to be used and held and owned by the local authority, agreed, but I do not think there is room for private enterprise and public enterprise together.

The President.—It is twelve o'clock and I think it is your desire that we should vote on the resolution, but the point is whether we should take Mr. Murray's proposal as an amendment.

A Voice.—Make it an addendum.

Mr. J. B. Hamilton.—Before you vote I should like to say a few words. I do not set myself up as an arbiter of what you should do; you must think for yourselves, but as one who has studied this subject a great deal and brought it before you in the best way I can, I am bound to say that I have certain views. Before expressing them, I should like to thank you gentlemen for the very kind and generous things you have said. The Committee here have fully sensed the gravity of the position at the present time, not because they have any fear with regard to the future of tramways, but because they see this very insidious effort to undermine their position and to place upon the public what will, in time, become an intolerable burden. My duty, as representing the Executive Committee, has been merely to light the fiery cross and to ask you, as representing the various communities up and down the country, to carry it back with you and keep it burning there. I want a wide resolution which will enable your Executive, as far as they can, not only to take this matter to the Ministry of Transport and to Municipal Corporations throughout the country, but to enthuse Members of Parliament, for, as an Executive Committee, we have very little political power. I do not want to pour vitriol into the resolution, and I think there is a touch of acid in the position taken up by the London people. I deeply sympathise with the London people in the position they are in. As Mr. Fell put it, they are a fearful example. It may be the fate of any of us to come to that, should local conditions permit it or give the opportunity for it, but does the addition of these words improve the fact that we are here and that we are, I hope, determined as a body to take action in such a way that will compel the attention of Parliament? There will be no part of my remarks, I hope, tinged with recrimination. It has been proved that we have not done our duty as an Association, or this might not have occurred. I would only say this, and I think I am right, that if the London people had acted unitedly, instead of one pulling one way and another pulling another, better results would have been obtained. Mr. Fell said they had ploughed a lonely furrow; I think they have. The efforts of the London County Council have been most admirable, and they have not asked for anything in their Bills but what they should have got. London, with its immense population and with its large number of Members of Parliament, should, through its authorities, have made this a burning question long ago, and should never have allowed themselves to get into the position they are in to-day. What I do want now is for the whole of this body—not only London, but also the whole of the provinces—to bring into action such powers as they already have. These powers are not in resolutions; they are in the things we can get our Parliamentary representatives to do. They are the last word in the whole matter, and with that expression I suggest that the resolution which was put before you this morning, as a combined effort of the Executive, really does meet the requirements. The resolution is an expression which I hope will be unanimous; it gives the opinion of this Tramway Association. Looking to the public interest, it gives expression to the feeling that they have as to what should be done, and done as quickly as possible. Mr. Young, of Dundee, appealed to my patriotic feeling by referring to the awkward position in which Scotland was placed, and I assure him that in the resolution as drafted there is every possibility of raising those points. It will be, as you can understand, if we get sufficient weight behind us, a matter of some negotiation, and unquestionably if competition is going to be allowed on our lines, then I think that as a corollary to that, public bodies should rightly be entrusted with powers to run long and short distances into the territory which private competition would probably like to reserve to itself. I think the resolution is wide enough, and I beg to reaffirm my opinion that the resolution as proposed and seconded should be the finding of this Association.

The President.—I do not know whether Mr. Murray would press the amendment?

Mr. Murray.—I should like it to go before the meeting.

The President.—Then I will put the resolution with the amendment moved by Mr. Murray. After the words "increased travelling charges to the public" it is proposed that the words "prove ruinous to the tramway industry and finally result in imposing intolerable financial burdens on tramway-owning and operating municipal authorities" should be added. That has been moved and seconded, and I will put it formally.

Mr. L. E. Harvey (general manager, Ilford Council Tramways).—Before you put it, I think it would be well to approach the Tramways and Light Railways Association to get their support. It would be very unwise to put anything about the other undertakings in the resolution until the Tramways and Light Railways Association has been approached.

The President.—That matter has been considered by the Executive but it was thought proper that our resolution should be confined to municipally-owned tramways. I put this amendment, which is moved by Mr. Murray and seconded by Alderman New, as I have indicated. All in favour of the amended resolution please signify in the usual manner.

On a show of hands 25 members voted for the amended resolution, but as a very much larger number obviously voted against, the amended resolution was declared lost without counting the adverse votes.

The original resolution was then carried unanimously, amid applause.

Alderman W. C. Fenton (deputy chairman, Sheffield Tramways Committee) suggested that a copy of the resolution should be sent to the Prime Minister, the Minister of Transport, and every Member of Parliament, asking their support to the terms of the resolution.

Councillor A. A. Thomson (chairman, Croydon Tramways Committee), suggested that a copy of the resolution be sent to the Town Clerk of each municipality concerned, in order that the tramways committees and local Councils may pass similar resolutions. He thought it would strengthen the position very considerably.

On the initiative of the president the following addition to the resolution already passed was agreed to—

> "That copies of this resolution be forwarded to the Prime Minister, the Minister of Transport, and to every Municipal Corporation that owns and operates tramways."

The members then adjourned for luncheon at the Manchester Town Hall at the invitation of the chairman and members of the Manchester City Tramways Committee.

LUNCHEON AT THE TOWN HALL, MANCHESTER.

On Thursday, the members lunched at the Town Hall, Manchester, at the invitation of the chairman and members of the Manchester City Tramways Committee. The Lord Mayor of Manchester (Alderman Wm. Kay) presided.

The Lord Mayor, proposing the toast of "The Municipal Tramways Association," dealt with the question of competition. There was nothing, he said, that so spurred a man or an industry on so much as competition—fair competition. (Loud applause.) If a man had anything in him, fair competition would bring it out. Public men should never be content to rest upon the efforts of their predecessors but should try to go one better every time. A meeting such as the Association was holding at Salford could not but be fraught with the very best results, because the members were comparing different methods, and although the other man's method might not be all good, nine times out of ten there was something good in it. He expressed the hope therefore that the members would go back to their respective cities and towns feeling they had spent a useful time, and had learned, not at the expense of, but to the advantage of their competitors something worth learning.

The President, on behalf of the Association, thanked the Lord Mayor and the chairman and members of the Manchester City Tramways Committee for the hospitality extended to the members. Referring to what some preferred to call equal competition, he said if the tramways could not run against equal competition they ought to go out.

Alderman R. Mayne (vice-president of the Association), proposed "The Chairman and Members of the Manchester Corporation." Speaking as a chairman of a tramways committee, he said in the old days the committees had to manage the trams; now, however, they had to manage the manager. He had found that where the committee was most concerned with the management of the details of the undertaking, the less successful were the trams run, but where most was left to the manager—(laughter)—the trams were run most successfully. If the committee were left with a great deal of work to do, they would be much better off with a new manager. He then referred to the headlines which had appeared in the press that morning, such as "exit trams" etc. He sometimes wondered

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what was meant by those suggestions that the time of the tramways was nearly up and where they emanated from. Those things were not said about other industries, and the tramway industry was not the only one which was higgledy-piggledy now. What about the coal mines, the engineering and shipbuilding industries, etc.? Did anybody say exit engineering or exit shipbuilding? If we were going on that way, then exit England. The tramway industry knew they were higgledy-piggledy, and the Association had met to talk over the difficulties and try to surmount them; there should be no deduction from this that things were worse than they were. So long as there existed such tramways committees and managers as there were at Manchester and other towns in the country there would be no fear of "exit trams."

Alderman J. Bowes (chairman, Manchester Tramways Committee), responding, expressed the pleasure of the Manchester Tramways Committee at there being such a good response to their invitation. They had felt it their duty, as the Association was visiting the neighbouring borough of Salford, to entertain the members in the principal city of the United Kingdom commercially. He hoped the result of the gathering of the members of the Association, particularly at that morning's conference, would redound and become historical for the tramway undertakings of the kingdom. He also appealed for fair competition with the tramways of the country.

Finally, a hearty vote of thanks was passed to the Lord Mayor for having accepted the chair during the luncheon, to which he briefly responded.

AFTERNOON SESSION

When the Conference re-assembled for the afternoon session, the **President** called on Mr. Chamberlain to read his paper.

PERMANENT WAY (PUBLIC ROAD) MAINTENANCE.

SOME NOTES ON THE EQUITABLE INCIDENCE OF THE COST.

By W. CHAMBERLAIN

(*General Manager, Oldham Corporation Tramways*).

The subject has frequently been discussed of the action to be taken by those responsible for operating tramway undertakings in order to obtain a measure of justice in respect of the unfair burden placed upon them by the Tramways Act of 1870, by virtue of which they are charged with the responsibility for maintaining a large portion of the roadway on which their tramways are laid, and of which they are only partial users.

After a period of 50 years, the question of road construction and maintenance has arrested the attention of Parliament. The subject is, without doubt, one of first importance. The evidence of it is found in the fact that legislation has been enacted to deal with the new methods of transport.

Tramway authorities were in high hopes that the unequal financial burden they had been called upon to carry would be corrected, but it would appear that the Government Department concerned has not been actuated by any lofty sense of justice in dealing with the subject, but was content to operate in the field of legislation for the most insistent and clamant—the usual plan.

If tramway authorities do not bestir themselves and become so importunate that they cannot be denied, they will make no progress with an admittedly just claim. The chief object in presenting this paper is to obtain the feeling of tramway authorities, and, if possible, to secure concerted effort in putting forward our claim for redress. Let us consider the conditions of to-day as compared with 50 years ago.

In 1870 the House of Commons first gave permission to tramway authorities to use public roads, and enacted that they should maintain that portion of the road which they used. At that time *every* vehicle on the road was horse driven, and they were necessarily of light construction. The tramway track was, in fact, materially worn by horses used for tramway purposes. No form of road transport has experienced such a radical change as tramways, and it is certain that Parliament did not then foresee the use of mechanically propelled vehicles, with the result that the intentions of Parliament are not being carried out to-day.

In 1870 turnpike trusts were common (but slowly ending), and each vehicle paid toll for road user according to a rough method of measuring the wear and tear it entailed. With the change in the form of traction, which does not, in fact, wear the road surface, it is just as reasonable—nay, it is more to the point—to refer us to the turnpike conditions, as it is to the conditions imposed by the Act of 1870. The old turnpike roads—our present "main" roads—were what may be described as "pay as you enter" roads and "pay according to the width of the wheels, and the amount of the wear and tear of the road surface you cost."

It is true that the conditions of the 1870 Act have been imposed by every private Act since that date right up to the numerous Acts of last year, but it is not pretended that these conditions are any longer founded upon any sort of principle. Surely, we are not always to be governed by that greatest of obstructionists, that venerable antiquarian, euphemistically known as "precedent."

The recent Court of Inquiry concerning the dispute of the tramway industry pointed out the recommendation contained in the Report from the Select Committee of the House of Commons on Transport, dated 25th July, 1919. It is as follows—

"Your Committee further consider that it is essential that there should be equal financial treatment of all surface means of locomotion which exist by an appeal to passenger traffic. They regard the rating of the trams, and their contribution towards the maintenance of the surface of the roads, as compared with the immunity of omnibuses from both these charges, as indefensible, and there are, in their opinion, no counterbalancing considerations of sufficient magnitude to induce them to modify this view. At the same tine, they do not propound any specific means of dealing with this problem, which would be one of the duties entrusted to the suggested traffic authority for recommendation to Parliament."

The Court of Inquiry added—"No doubt the Minister of Transport has considered the subject of providing some contribution towards the additional cost of road maintenance caused by heavy vehicular traffic, which may pass through districts that derive no advantage from it, causing damage to the tramway track, the full cost of which is at present borne by the tramway undertaking."

Sir Eric Geddes, speaking on the Roads Bill in the House of Commons in December last, did not attempt to oppose the claim of tramway authorities on principle. He said—

"This is a very much wider question than dealing purely with tramways. Tramways, waterworks, gasworks, railway companies, and a variety of undertakings have to come from time to time under statutory obligations to maintain portions of the roads of the country. It is the statutory obligation of tramway companies to maintain the roads. If it is a wrong one, let them come to the House. "I have a great deal of sympathy for tramways. There may be a case at a later date for revising the Tramway Statutes, but this is not a Bill for revising the statutory charges imposed on the tramways and other undertakings such as gas, electricity, and water."

Such were the arguments used in the House of Commons when the claim of the tramways was put forward for consideration in framing the Roads Bill. The mere suggestion of placing tramways in the same class as gas, water, and electricity undertakings is a fine example of confusion of thought, or, maybe, of want of acquaintance with the subject.

It is well known that when roads are *disturbed* by any undertaking, they are under a statutory obligation to reinstate the road, and I am sure that they have no desire to escape such an evident and just obligation, but there can be no analogy between this obligation and the one imposed on tramway authorities whereby they are called upon to *maintain* the roads. Our claim is that new conditions demand new treatment. We cannot continue under conditions imposed in a previous generation, and calmly witness the enactment of legislation which leaves us in the wilderness. The conditions are progressively worse for tramway undertakings.

It has been estimated that the amount of traffic by road, both in passengers and goods, is probably at least three times as large in number and tonnage as is conveyed by railways.

A recent traffic census taken in an industrial town showed that over a period of seven days the amount of traffic carried over the tramway system was as follows—

Trams	9,503
Other vehicles	41,363
Percentage of tramcars to other vehicles ...	24 per cent.

Municipalities, and particularly those which operate tramways on main inter-town roads, are placed in a very serious position. Those of us who have had to reconstruct any portion of our track know only too well the effect of heavy mechanically-propelled vehicles on the concrete foundations, especially where the roadway between the curbstone and the 18 in. margin of the tramway has not been constructed on modern lines. In these cases, the effect of the passing of heavy traffic is such as to cause this portion to be almost impassable for mechanically-propelled vehicles, with the result that the bulk of the traffic is carried on that portion of the roadway maintained by the tramway authority.

It is also frequently found that the concrete foundation is cracked or otherwise defective, and to meet the needs which spring from the introduction of heavier road transport a thicker or re-inforced concrete foundation has to be substituted.

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It has been stated that owing to the financial state of tramway undertakings generally the track has been neglected during recent years. This is true to some extent, but defects in the roadway, largely caused by heavy traffic other than tramcars, have now to be made good by tramway authorities, and the repaired roadways are used in common by *all* road users.

If tramway tracks are in want of repair it will be generally found on investigation that the remaining portion of the roadway is in quite as bad, if not in a worse condition.

The principle for which we contend is, in fact, recognised in the Finance Act 1920, which imposes a graded system of excise upon all mechanically-driven road vehicles by way of an attempt to assess

Mr. W. Chamberlain.

the burden in accordance with the measure of the user of the road—that is all the tramway authorities ask for. At present we are required to construct that part of the road in which tramways are laid, and thereafter to bear the full cost of maintenance.

When we have constructed the road we have created a ratable hereditament as though we have erected a building, and henceforth are rated upon it. The extent to which we contribute directly by the process of rating is probably not at all adequately realised.

In the Lancashire and Cheshire area the amount paid in local rates by the tramway authorities in 1920-21 was £260,235. In addition to this expenditure, the amount incurred by the tramway authorities in this area during the same period on permanent way maintenance, was £380,084, to which must be added the sum of £627,051 on permanent way reconstruction, making a total expenditure for one year on permanent way works of £1,007,135.

Let me take an illustration from the borough I represent. The amount paid in local rates for the year 1920-21 was £6,381. Of this sum £5,363 was in respect of permanent way.

The total traffic revenue for the year 1920-21...		£245,616
Total capital cost of permanent way to March, 1921		£244,655
Length in route miles		24 miles
"A" The cost of permanent way maintenance, 1920-21		£28,190
The cost of permanent way reconstruction, 1920-21		£25,368
	Total ...	£53,558
"B" Amount paid in local rates in respect of permanent way, 1920-21, was		£5,363
	Total of "A" and "B" ...	£58,921
The percentage of permanent way costs to traffic revenue was therefore		24 per cent.

In other words, although we are the minor users of the roads, as every traffic census shows, we are the major contributors to their cost. These examples only serve to emphasise the burden borne by the industry.

Lord Montagu, in his series of articles recently published in *The Times* on "Road Reform," seems to regard tramways as being an "out-of-date" system, and thinks they should not be allowed to run on the public highways. This may be the view-point of the class for which His Lordship speaks. But the matter cannot be dismissed quite so readily. Lord Montagu does not suggest any alternative form of traction, and it remains an undisputed fact that tramways are the cheapest form of traction yet evolved for the movement of large bodies of people.

Further, let us suppose for a moment what would be the result of tearing up the tramways. Would the withdrawal of tramways cause any less wear and tear to the road? On the contrary, it is certain that a very large additional cost would have to be borne by the Roads Fund.

It has been argued that tramways do not contribute to the Roads Fund by means of taxation. As is well known, the cost of an excise licence for a tramcar is 15s., and tramway authorities, I am sure, have no desire to be exempt from making a fair contribution to this fund upon level terms. If it were thought desirable that tramways should contribute to the Roads Fund in addition to being rated on account of their tramway, I think there would be little objection if an equitable graded system was adopted.

The equities of the case, and the conditions governing the rating and taxing of other forms of mechanically-propelled vehicles, whether for passengers or merchandise, demand a considerable transference of the burden of road maintenance.

Some ask "To whom would the burden be transferred?" Would it be to another department of the same authority? The answer to this question is twofold. Firstly, tramways are a commercial enterprise. They should, therefore, depend upon their own earning power, and should not be required to carry a burden directly imposed by other road users, and, as we know in some instances, by their own competitors. Secondly, road maintenance—at any rate, first class and other graded roads—is no longer borne by local taxation, and, therefore, it is not a case of transference from one pocket to the other. It is now in part spread over the actual users of the road through the medium of excise licences, and these licences should, in my opinion, be extended to embrace *all* users of the roads.

The equitable incidence is in part admitted, and the principle should be pushed to its logical conclusion.

The President.—We are indebted to Mr. Chamberlain for his able paper on a subject which is prominently, at the present moment, before all tramway authorities. Unfortunately we are much pressed for time, and we have some important matters to discuss on the business agenda. There have been one or two suggestions that the discussion should proceed, and another that those gentlemen who would like to contribute to the discussion should send in their statements to the secretary, who would hand them over to Mr. Chamberlain, whose reply would be printed and issued with the other reports—(hear, hear)—if Mr. Chamberlain would not mind. We appreciate the paper very highly. (Applause.)

The President (continuing).—There is one little matter which we forgot this morning, and that is formally to thank Mr. Hamilton for his very able paper. (Hear, hear.) If you like, we will combine the thanks of the meeting to both Mr. Hamilton and Mr. Chamberlain in one resolution. We thank Mr. Chamberlain and Mr. Hamilton most earnestly for the great trouble they have taken in preparing the papers and hope they will accept these thanks in the spirit we offer them.

Mr. Baker seconded, and the resolution was warmly approved.

ANNUAL GENERAL MEETING.

The annual general meeting was held immediately after the reading of Mr. Chamberlain's paper. The president was in the chair. The proceedings were private. We give below the official account of what took place.

The report of the Executive Council was unanimously approved. After discussion of questions relating to the operation of tramways on Christmas Day, the adjustment of wages on the sliding scale, and holidays with pay, a proposition was put in the following terms—

> "That in view of the fact that members of the Executive Council are elected by the representatives of the municipal tramways undertakings and act for them as a whole and not for the individual undertaking to which they happen to belong, it be resolved that the expenses of the said members incurred in attending the meetings of the Council, or in connection with any other business of the Council, be charged on the funds of the Association."

This proposal was defeated.

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The election of officers resulted in the following appointments—

PRESIDENT.—Alderman R. Mayne (Deputy Lord Mayor of Newcastle-on-Tyne and chairman of the tramways committee).

VICE-PRESIDENT.—Councillor J. Timpson (Mayor of Portsmouth).

HON. TREASURER.—Mr. A. R. Fearnley (Sheffield).

HON. SOLICITORS.—Mr. S. J. James (town clerk, Ilkeston); Mr. P. M. Heath (deputy town clerk, Manchester).

AUDITOR.—Mr. J. W. Blakeborough.

MEMBERS OF COUNCIL.—Alderman H. Clark (Mayor of Rochdale), to take the place of Councillor Timpson, elected vice-president.

The following retired and were re-elected—Mr. A. L. C. Fell (London County Council); Mr. J. B. Hamilton (Leeds); Mr. R. L. Horsfield (Cardiff).

A resolution was passed on the motion of the **Mayor of Rochdale,** seconded by **Mr. F. Buckley** (general manager, Bury), conveying the thanks of the meeting to the retiring president. This was carried with acclamation, and the president suitably replied.

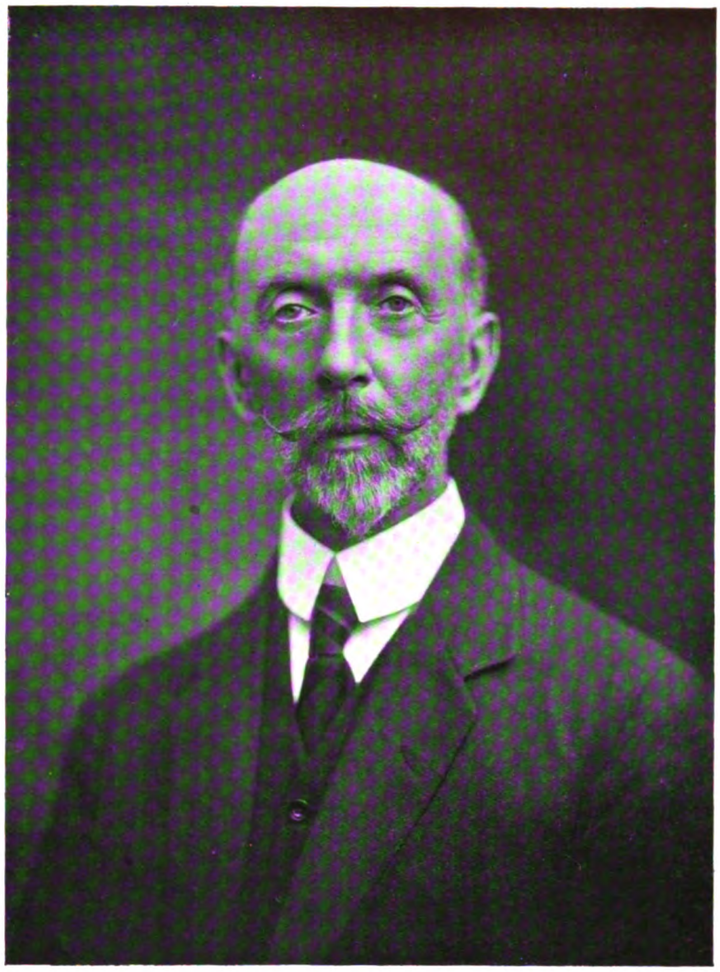
On the motion of **Councillor D. D. Irving, M.P.** (vice-chairman, Burnley), seconded by the **Mayor of West Ham,** a hearty vote of thanks, expressing the high appreciation of the conference, was passed to the Executive Council for its work during the past year.

On the proposition of **Councillor T. Canby** (deputy chairman, Huddersfield), seconded by **Councillor G. J. Allen** (vice-chairman, Croydon), the conference recorded its indebtedness to the representatives of the Municipal Tramways Association upon the National Council for the ability and patience which they had brought to bear on the subjects that occupied their judgment during the year, and expressed general satisfaction with the results of the second year's working of that Council.

The Secretary read a letter from Mr. McElroy in answer to the telegram he had sent on the previous day, as follows—

> "Will you please convey to the conference my thanks for their telegram and for the kind expressions regarding my bit of paper. I have been thinking of you all, all the time, as Lincoln said."

A vote of thanks was passed to the Salford Corporation for the arrangements made in connection with the conference, and **Alderman Barrett** (chairman of the Salford Tramways Committee) suitably replied.



Alderman R. Mayne.

THE ASSOCIATION DINNER.

The Association dinner was held at the Grand Hotel, Manchester, on Thursday, September 29, the president in the chair.

The loyal toasts were duly honoured.

Councillor J. Timpson (Mayor of Portsmouth), proposing "The Ministry of Transport," assured Mr. Arthur Neal, M.P. (Parliamentary Secretary to the Ministry of Transport), who was a guest, that the feeling of the tramways industry towards the Ministry of Transport was all that even the Ministry could desire, and the tramways industry only hoped that that same feeling would be duly reciprocated. He believed that would be so. All those connected with the industry would agree that there was never a time when it was more imperative that that feeling should exist than to-day. They had had their troubles during the past few years, but within the next few years they would have to face even greater difficulties and troubles. All industries were feeling the aftermath of the great war, and the tramways industry would have to look to the Ministry for consideration and help during the troublesome times that were to come. It was not only with that Department, but the Department of the Ministry of Labour, as well, that the industry had to deal. The Ministry of Transport would find the representatives of the tramway industry at the door of the Ministry rather often during the coming year, and he hoped they would be prepared to give the industry fair dealing and fair play. When the industry came to the Ministry, as they would probably have to do in conjunction with the private companies, and asked for something which they had been discussing that day, it was to be hoped that the Ministry would have some regard to the importance of the industry, and that the industry would not call on the Ministry in vain.

Mr. Arthur Neal, M.P. (Ministry of Transport), replying to the toast, said that transport was, of course, of supreme importance. It was one of the common elements of our daily life, but we were apt to forget the unspeakable importance of it. One of the great difficulties to-day on the Continent was the complete breakdown of transport; the position in Russia would be very much easier, too, if there had not been a collapse of transport. We in this country must realise that the cheap and efficient transport of goods and people was absolutely essential to the restoration of the prosperity of the country. It was with that view in mind that his distinguished Parliamentary Chief had inaugurated the work of the Ministry of Transport. It might be said that the great event of the last Parliamentary session had been the passing of the Railways Act, which would remain for all time a tribute to the untiring energy of Sir Eric Geddes. The Railways Act was designed and intended as one of those great permanent measures which would make commerce easy, and to that extent prevent the calamity which was upon us at the moment, namely, unemployment. At one stage or another of the proceedings during the passage of the Bill through Parliament, no fewer than 4,350 amendments had been dealt with. Turning to road transport, this assumed a completely new aspect during the past few years, and although the maintenance of the roads of the country was now taking on a national aspect, he uttered a warning to local authorities not to expect too much from the central Government, much in the same way that too much could not be expected from the central Government in respect to unemployment. He then referred to a deputation which he had received at the Ministry of Transport from the Municipal Tramways Association and the Tramways and Light Railways Association, from which it would be seen that tramway undertakings had shown their confidence in the Minister of Transport. They had previously asked that he would take over the duty of fixing their actual charges for them, to enable them to meet their increased costs, and, as everybody in the room was aware, a special Act was passed, and the Minister had been discharging those duties with, he believed, satisfaction. The deputation had asked him that that system might be made permanent and that the Government would, instead of leaving each undertaking to go to Parliament for private Bill powers, deal with the matter by the continuation of that legislation. No actual

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decision had yet been arrived at on the main question. That involved political difficulties and he did not pretend to say what the attitude of the next Minister of Transport would be, but he was in a position to say that the Government was prepared, in the next session of Parliament, to promote legislation to carry on for another twelve months at least the method of fixing charges which was now in operation. That would see them through, he believed, until February, 1924. (Applause.)

Alderman W. C. Fenton (deputy chairman, Sheffield Tramways Committee), proposed the toast of "The Salford Corporation Tramways Committee and the Manchester City Tramways Committee" in the absence of the new president, Alderman R. Mayne.

Alderman Barrett (chairman of the Salford Tramways Committee) replied on behalf of Salford, and referred to the great services which the late Alderman Linsley had rendered as chairman of the Salford Tramways Committee.

The President, in announcing the receipt of a letter of regret from the Lord Mayor of Manchester at his inability to be present at the dinner, mentioned that the Association was born within a few hundred yards of the Grand Hotel. He believed the first meeting was held in the Manchester City Tramway Offices in Piccadilly, twenty years ago; it would attain its majority next year.

Alderman J. Bowes (chairman, Manchester City Tramways Committee), also replying to the toast, said he looked upon tramways as an essential part of the government of a city. Manchester had a population of 900,000, and there was a great influx of people from the outside areas every day which had to be dealt with satisfactorily. It could not, however, be dealt with so satisfactorily as by tramway. Manchester had spent £2,500,000 on the tramway undertaking. It was the third largest tramway concern in the country, London and Glasgow coming before, and last year they had had a record revenue, viz., £1,802,280, but the expenses were terrible. In 1914 they paid £371,192 in wages, but last year these amounted to £1,142,064. That meant an increase of 208 per cent. It was not wages alone, however, that had gone up. All the blame must not be put on to the working man, although he believed that wages must come down. The expenditure on materials had increased by 357 per cent. as compared with 1914, so that it behoved them all to put their best efforts forward.

Councillor D. D. Irving, M.P., proposed the toast of "The Visitors," to which **Mr. G. H. Roberts, M.P.,** late Minister of Labour and Food Controller, replied. He said it might be his duty to convey across the floor of the House to the Parliamentary Secretary to the Ministry of Transport, who had not attended the conference, some of the sentiments which had been expressed during the discussions. There were aspects of tramway conditions which rightly demanded consideration at the hands of the Government, but he appreciated the courage and candour of Mr. Neal in advising the industry not to expect too much, because after all the Government to-day had its limitations. Personally, he was of the opinion that the less the Government was allowed to interfere with industry the better, and he had for a number of years been a strong advocate of the principle of self-government in industry. He believed the industry was emerging from the present troublesome period all the better because of the fact that it was resorting more to the principle of a Joint Industrial Council rather than to a State Department. We must carry our own troubles. Finally, Mr. Roberts urged the necessity for co-operation between labour and capital, and impressed upon labour a recognition of the principle that wage earning must go hand in hand with productive capacity.

Bailie M'Whirr (convener, Glasgow Tramways Committee), proposed a vote of thanks to the president, to which **Mr. Holford** briefly replied.

EXECUTIVE COUNCIL'S ANNUAL REPORT.

Review of a Busy Year.

How indispensable is the Municipal Tramways Association to local authorities owning and operating tramways a glance at the annual report of the Executive Council is sufficient to show. Of the 102 civic bodies working tramways, 95 are members of the Association.

The Court of Inquiry.

The outstanding feature of the year was the Court of Inquiry into the condition of the industry—an inquiry which followed the declaration by the employers' side of the National Council of their inability to grant the application made by the employees on October 15, 1920, for a further increase of wages of 12s. and 6s. per week. An exhaustive investigation previously made by the general secretary and Mr. Cliff (representative of the employees' trade unions) into the financial position of municipal tramway undertakings, disclosed that the all-in-all operating costs during September and October, 1920, exceeded the traffic revenue by 3·55d. per car-mile, or by over 15 per cent. of the aggregate earnings. On April 28, 1921, the report of the Committee of Inquiry was received from the Minister of Labour, and the National Council appointed a joint committee of ten members to consider the report. On June 16 the joint committee presented a report on the four recommendations of the report with only one employees' representative dissenting. In part, the joint committee's report is as follows—

(1) That the joint secretaries prepare a list of those undertakings which have not observed the previous agreements and awards in regard to wages advances.

(2) That the present rates of wages should be maintained until the commencement of the first full pay period in August, 1921.

That on and from the commencement of the first full pay period in August, 1921, reductions from, and additions to, wages shall be at the rate of 1s. per week for each complete five points variation either way in the cost of living index figures commencing from the figure of 135 per cent. over the August, 1914, cost of living.

That hereafter the adjustment of wages shall be regulated every three months.

That this arrangement shall be terminable by three months' notice from either side, but no such notice shall be given before December 31, 1921.

That no reduction in wages shall operate on any undertaking where the total war wage increase of 40s. (exclusive of basic rate increase) is not now being paid, until the rate of increase is equal to the current general increase obtaining in the industry.

(3 and 4), it is agreed that recommendations 3 and 4 be accepted, and that negotiations be continued by this committee with the object of preparing a scheme for the standardisation of wages, and report not later than the November meeting of the Council.

Tramways Finance.

Dealing with "Tramways Finance, 1920-21," the report directs attention to the fact that in most cases the published balance sheets did not make any provision for renewals not actually effected before arriving at the balance, either deficit or surplus. In general it was one of the conditions imposed by orders issued under the Tramways (Temporary Increase of Charges) Act, 1920, which authorised increases in statutory fares, that "reasonable provision for the proper repair, maintenance, and renewal of the undertaking" is made. "It is a striking fact," says the report, "that only five undertakings succeeded in earning sufficient revenue to enable them to make provision for the renewal of the permanent way at the rate which is generally recognised as now being necessary, viz., 2½d. per mile." On this basis, after deducting net aggregate surpluses (£185,114) there is a net aggregate deficit for the year of £2,356,552. The aggregate amount of surpluses without any provision for renewals is £1,029,706, and the aggregate amount of deficits is £844,592.

Form of Accounts—Proposed Annual Analysis.

After representations had been made by the Council, the Ministry of Transport relieved tramcars from the regulations requiring all road passenger vehicles to display the local taxation licence and the hackney carriage plate. The Ministry having raised the question of modifying and enlarging the present standard form of tramway accounts and statistics, Messrs. Dalrymple and Fearnley were chosen as the Association's representatives on a committee appointed by the Ministry to investigate and report. The Council propose to begin the compilation of an analysis of British municipal tramways accounts and statistics in a form not at present available, and to print the same annually, if possible, with the annual report. Such a publication will in due course, the Council state, become invaluable to the members of the Association, who are urged to co-operate expeditiously with the general secretary in the matter.

Incidence of Maintenance Cost of Permanent Way.

During the passing of the Roads Act, 1920, strenuous efforts were made to secure to tramway authorities some share of the proceeds of the excise duty imposed upon mechanically propelled vehicles by the Finance Act, 1920. Every member of the House of Commons was informed that tramway authorities were put to increasing expense in the maintenance of the permanent way owing to its progressive use by heavy vehicles, which in some instances were operating in competition with tramways. The proposals made on behalf of the Association were opposed by the Minister of Transport and defeated.

Strong emphasis was laid upon this aspect of tramway finance during the holding of the Court of Inquiry, and the Court directed attention to it by quoting an extract from the conclusions arrived at by the Select Committee of the House of Commons on Transport (Metropolitan Area) of July, 1919. The Select Committee expressed the necessity for equal financial treatment of all surface means of locomotion for passenger traffic, and observed that no doubt the Minister of Transport had considered the subject of providing some contribution towards the additional cost of tramway tracks due to heavy vehicular traffic passing through districts that derived no advantage from it.

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In March last the Council drew the attention of the Minister of Transport to the matter, and suggested he should appoint a special committee to investigate the whole question of the cost of maintenance of tramways permanent way. His reply was, "The expense of the maintenance is specifically charged upon the tramways undertaking by the Tramways Act of 1870. In these circumstances it is not clear what useful purpose it is considered would be served by such a committee." In view of the change in the conditions of road user since horse tramway days, the Council renewed their application, and stressed the growing discontent with the disabilities and hardships imposed upon tramway authorities, but in June last the Minister replied that he did not see his way to adopt the suggestion.

FRONT EXIT WITH FOLDING STEPS—LIFEGUARD EFFICIENCY.

Representatives of the Council had had an interview with the Ministry of Transport with reference to the revision of the memorandum regarding details of construction of new lines and equipment. The Association dissented from the proposed requirement that "in the case of new cars, designed for exit (or entrance) at the leading end on the near side, the steps used for the purpose must be of the folding type." As to lifeguards, the Association recommended a guard of rapid action without prescribing any particular type, and that the actuating spring of the tray should be so designed that a pull of from 50 to 56 lb. should be necessary to lift the tray from its actuated position. The Minister had replied that he was advised that the provision requiring folding steps should be retained, and in the case of lifeguards, he was prepared to agree to a pressure of 50 lb. as the minimum pull necessary to lift a lifeguard tray off the ground. The Council "look forward to further developments in lifeguards, and they are of opinion that when accidents do occur the effect of them upon those who may be involved should be as slight as the most complete mechanical contrivance can secure." With regard to folding steps, they "are of opinion that these will impede the efficient operation of tramways, and afford no compensating advantage."

BRITISH AND NON-BRITISH RAILS—MISCELLANEOUS ITEMS.

The president, Messrs. Fearnley, Ferguson (Glasgow), Hamilton, and Mattison (Manchester) had been appointed a sub-committee to conduct a scientific investigation into the relative value of British and non-British made tramway rails. Among other subjects alluded to in the report are the following—Lights on tramcars, width of loads on motor lorries, conveyance of cinema films, rule of the footpath, National Trades Advisory Committee, annual rates of depreciation on motor omnibuses for income-tax purposes, allowances for income-tax purposes for depreciating of permanent way by wear and tear, standardisation of ball and roller bearings and gear cases, types of trolley collector gear, division of duties of electricians, wiremen, fitters, etc., annual meeting of the managers' section, National Tramways Football Shield, guarding cross-roads, stay wires, expenses of members of the Council, and the Electric Vehicle Committee.

TRAMWAYS (TEMPORARY INCREASE OF CHARGES) ACT.

At July 13, 1921, forty-two municipalities had made application for orders to increase statutory fares under this Act, which was passed in 1920. The Act would expire in February or September, 1923 (that is to say, two years after the official termination of the war), and in conjunction with the Tramways and Light Railways Association, steps are being taken to ensure the continuance of its main provisions after that date without recourse to Private Bill legislation by individual members. The interests of railless traction systems not covered by the original Act are receiving attention. A sub-committee are considering simplification of the procedure now required in order to obtain the benefit of the Act.

RAIL CORRUGATION.

On April 29 last the Rail Corrugation Committee held their final meeting. The Committee had been holding meetings and conducting experiments in the Kingsway subway of the London County Council Tramways since 1914. The Council had cordially thanked Mr. W. Worby Beaumont for his services as chairman of the committee, and Messrs. Fell, Ireland, and Welling for their skill and patience in conducting the experiments. Appendix 1 gives an account of the proceedings of the committee, and concludes as follows—

> There is no appreciable difference in the depth of the corrugation of the rails of the standard laying and those of the special layings which have been under experimental observation.
>
> The sub-committee have observed the growth of corrugation of rails over the greater part of London, and these observations (including those relating to the very marked corrugation formed in the bottom of the groove of much worn rails on straight lines by the flanges of the car wheels) lead to the same conclusion, namely, that corrugation of steel rails is inseparable from the action of the heavily loaded wheels rolling along the surface of the tread of rails, and that this rolling originates the corrugation by giving rise to superficial stresses in the material of the rail thread which are in excess of the elastic limit and of the toughness of that material.

ASSOCIATION AND COUNCIL MEETINGS.

During the year two special general meetings of the Association were held in London. On November 16 a meeting was held to consider the application of the trade union representatives of the employees upon the National Council for the 12s. and 6s. per week advance on wages, which was referred to the Association's representatives on the National Council. On March 17 a meeting was held to consider the report of the Court of Inquiry. The further consideration of that report was referred to the Association's representatives on the National Council with full discretionary powers; and the Association placed on record their high appreciation of the valuable services of Messrs. Hamilton, McElroy, Fell, and Fearnley in preparing for and submitting to the Court of Inquiry the case for the municipal tramways authorities comprised in the Association. The cost of preparing and submitting the case was £1,615, which was met by a special proportional levy. Ten meetings of the Executive Council were held since July 9, 1920.

THE NATIONAL COUNCIL.

The representatives on the National Council were Messrs. A. Baker, J. B. Hamilton, N. J. Young, and H. P. Stokes, the two last-named succeeding Sir J. Courtis and Mr. P. Fisher. Nine meetings of the Council were held during the year, and the report gives the decisions arrived at on various matters. Among the subjects considered were the following—Workers' Union and Municipal Employees' Association and membership of the Council, works committees, superannuation of employees, standardisation of wages, spread-over duties, wages, increase in holidays with pay, Christmas Day tramway services, and the Court of Inquiry.

APPENDICES TO THE REPORT.

Appendix 1 (as already stated) gives the report of the Corrugations Committee, consisting of Mr. Worby Beaumont, Prof. C. A. Carus-Wilson, Messrs. A. L. C. Fell, H. J. Howley, W. E. Ireland, A. H. Pott, and J. Welling.

Appendix 2 showed (1) tramway authorities (five in number) which contributed to the rates in 1921-22, and authorities (33) which received aid from the rates to meet deficiencies in the same period.

Appendix 3 is a return showing (1) each member's annual subscription; (2) apportioned share of cost of Court of Inquiry; (3) gross revenue from each undertaking for 1920-21; (4) the financial results of operating municipal tramways for 1920-21.

Appendix 4, accounts of the Municipal Tramways Association for year ended June 30, 1921.

Appendix 5, terms of agreement arrived at between representatives of the Municipal Tramways Association, the Tramways and Light Railways Association, and the National Transport Workers' Federation on March 20, 1919. This agreement relates to conditions of labour for employees in reference to the 48-hour working week and other matters. Decisions are also set forth in 16 cases of dispute from municipal and company tramways, which came before a Standing Joint Committee of the National Council. This committee have resolved that all tramway authorities be requested to submit to them any doubtful point arising out of the agreement which is likely to lead to trouble, in order to minimise local disputes as far as possible.

CONFERENCE INTERLUDES.

The weather throughout the Conference was superb, and visitors were convinced that, in spite of tradition, Manchester and Salford were centres of light as well as leading. On Tuesday evening there was a reunion at the headquarters of the Executive Committee at the Midland Hotel, where members were received by the President and Mrs. Holford. On Wednesday evening a conversazione was held at the Town Hall, Salford, where the Mayor, the Mayoress and Miss Hampson received the guests, for whose entertainment an excellent musical programme was provided. Recitations by Miss Hampson were also much appreciated. The Annual Dinner at the Grand Hotel on Thursday evening was largely attended, the guests of the Association including Mr. Arthur Neal, M.P, and Mr. G. H. Roberts, M.P. The toast to the President, which closed the proceedings, was more than a formality, for it expressed the cordial thanks of the members for the assiduous care devoted by Mr. Holford to arrangements for their comfort and pleasure throughout the Conference. On the Friday a large party made an excursion to Chester by motor coaches, which were provided by Mr. E. H. Edwardes, general manager of the Lancashire Tramways Company. A start was made from Manchester soon after ten and Chester was reached about twelve, all the Dennis coaches making the run in a most satisfactory way. After luncheon at the Grosvenor Hotel the party made an excursion on the river, and were entertained at tea by the Mayor, the Sheriff and the Chairman of the Tramways Committee.

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TRAMWAY PASSENGER STATISTICS.

To the Editor of the "Tramway and Railway World."

Dear Sir,—The statistical information published by most municipal tramway undertakings includes a figure purporting to represent the number of passengers carried per car-mile.

The figure is obtained by dividing the number of tickets issued by the number of car-miles run. The figure does not represent the number of passengers carried per car mile, but merely shows the number of tickets issued per car-mile run. This, as I will attempt to explain, is very misleading.

I will take for my example an exaggerated simple case. Suppose we have a route three miles long and we carry three passengers for the whole distance. Three tickets are issued and three miles run, so the figure which would appear in our statistical information would be $\frac{3}{3}$ = one passenger per car-mile. Now suppose that three passengers boarded the car and travelled only one mile and are then replaced by three more, and those in turn by three more. We shall then have sold nine tickets and travelled three miles, so then the cipher will now be $\frac{9}{3}$ = three passengers per car-mile. In both instances we are carrying the same number of passengers per car-mile. This is a simple case but sufficient to show that as a figure representing the number of passengers carried per car-mile, the present method is quite worthless.

In order to obtain a figure that at any rate will be approximately correct and useful for comparative purposes, I suggest the following simple formula—

Let X = The average fare paid per passenger in pence (this figure may be obtained by dividing the fare traffic revenue by the total number of tickets issued).

Let Y = Average distance in miles passengers are carried for one penny (this factor may be obtained for each undertaking by finding the highest common denominator for all fares (usually ½d.) and finding the average distance carried for this amount on all stages, including, of course, the number of stages for each value). For instance—

Number of 1½d. stages = 15.
Number of ½d. in 1½d. = 3.
Average distance of 1½d. stages = 1 mile 300 yards.
Distance carried for ½d. = ⅓ of 1 mile 300 yards = 686 yards.
Number of 2d. stages = 8.
Number of ½d. in 2d. = 4.
Average distance of 2d. stages = 1 mile 1225 yards.
Distance carried for ½d. = ¼ of 1 mile 1225 yards = 746 yards.
1½d. stages—15 × 3 = 45 × 686 = 30,870
2d. stages— 8 × 4 = 32 × 746 = 23,872

77 54,742

Average distance carried for ½d. = 54,742 ÷ 77 = 711 yards.
" " " 1d. = 1,422 yards.
= ·808 miles.

Let N = Total number of passengers carried.
Let M = Total mileage.

Then the passengers carried per car-mile = $\frac{N \times X \times Y}{M}$

This will be an approximate figure owing to the differentiated workmen's fares, etc., but in my opinion would be a much more useful figure for comparative purposes than the one now used.—

Yours faithfully,
C. Owen Silvers
General Manager and Engineer,
Wolverhampton Corporation Tramways
October 5, 1921.

NATIONAL TRAMWAYS COUNCIL.

Final Meeting of the Year.

A meeting of the National Joint Industrial Council of the Tramways Industry was held at Montagu House recently. Mr. J. M. McElroy (general manager of Manchester Corporation Tramways) and Councillor J. Timpson (Mayor of Portsmouth) were unable to attend on the ground of ill-health, as was also Alderman W. G. Wylie and Mr. C. G. Tegetmeier. Mr. H. England, Mr. A. R. Fearnley, and Mr. T. Goodyer were absent owing to urgent calls elsewhere. Councillor W. J. Squires, London County Council, presided.

The Council had before them the minutes of all the District Councils held during the last six months. They also considered the question of the procedure to be adopted in the case of the Manchester Corporation Tramways employees' application for increase in wages. After some discussion, and by consent of both sides of the Council, the matter was referred to a special joint committee, which has been set up to deal with the question of wages standardisation, and modifications in the conditions of service affecting tramways employees.

The vexed question of the operation of tramways on Christmas Day was also considered. It transpired that in some districts the men have already met and decided they will not work on Christmas Day. The employers put up the proposition that where in the public interest and to meet public requirements a tramway undertaking required the men to work on that day, they should be urged to do so. The Council was unable to reach any agreement, both sides taking totally opposite views.

The next matter to be discussed was that of the wages of youths under 21 employed on tramways, and this was referred to the Wages Standardisation Committee, together with the Manchester case above referred to, for urgent consideration.

It was the last meeting of the year, and closed with a hearty vote of thanks to the chairman, Councillor Squires, J.P., London County Council, and Mr. S. Hirst (vice-chairman). It was also the last meeting at which Mr. J. B. Hamilton will be present prior to his departure for his tour in the East, and the members of the Council extended to him their hearty good wishes for a pleasant journey, and hoped to see him back again safe and sound in due course.

L.C.C. CONTRACTS FOR TURBO-ALTERNATORS.

The London County Council having resumed its regular meetings after the summer recess, the Highways Committee reported with reference to the following tenders for an 8,000 kw. turbo-alternator which had been referred to them by the Council.

Ateliers de Construction Oerlikon (at 22 fcs. to the £) ...	£45,886	
Brown, Boveri and Company, Limited (at 22 fcs. to the £)	£45,916	
Ditto (alternative offer) (including £500 special works)	*£45,939	
		Without restrictions as to obtaining materials.
Escher Wyss and Company S.A.	£52,484	
Daniel Adamson and Company, Limited ...	£60,104	£50,800
English Electric Company, Limited	£61,738	£52,340
C. A. Parsons and Company, Limited ...	£62,639	£53,110
British Thomson-Houston Company... ...	£62,713	£53,303
Richardsons, Westgarth and Company ...	£62,860	£53,280
Belliss and Morcom, Limited	£63,341	£54,290
Metropolitan-Vickers Electrical Company ...	£63,387	£50,725
James Howden and Company, Limited ...	£64,954	†£47,410
Fraser and Chalmers Engineering Works ...	£64,954	£55,050

* Irrespective of variations in rate of exchange. † Incomplete.

The first three tenders which were submitted by foreign firms are subject to any import duties which may be imposed at a later date. All the English firms offered a reduction on the prices quoted by them, provided they were given a free hand to buy foreign material. The revised amounts are shown in the table above. The difference between the lowest satisfactory foreign tender and the lowest acceptable English tender amounts to nearly £8,000, or 16 per cent. of the total amount. The Highways Committee recommended the acceptance of the alternative offer of Brown, Boveri and Company, Limited, amounting to £45,939.

Traffic Returns.

The number of passengers carried by the Council's tramways during the twelve weeks ended September 28, 1921, showed a decrease of 11,029,424 as compared with the corresponding week in 1920. The total traffic receipts for the same period showed an increase of £139,141. From the beginning of the financial year to the week ended September 28, the total increase in traffic receipts amounted to £361,369. The figures include the Leyton system, which comprises 8·95 miles in length, the working of which was taken over by the Council on July 1, 1921. The total mileage now worked by the London County Council is 155·84 route miles.

All tramway reports were adopted.

Mr. W. J. Squires (chairman of the Highways Committee) stated, in answer to a question, that the total estimated expenditure on tramway maintenance for the first six months of the year had been exceeded, and unless stringent economy were exercised the cost would be in excess of that allocated by the Council. The question of applying for help from the Ministry of Labour and the Ministry of Transport would come before the committee at its next meeting.

Dundee, Broughty Ferry and District Tramways Company.—The report shows that the profit for the year ended July 31, including £309 brought forward, amounted to £6,682, the balance, after payment of interest on debenture stock and interim preference dividend, amounting to £4,433. They propose to pay a dividend on the ordinary shares of 7 per cent. for the year, less tax, and to place £1,500 to the reserve fund, leaving £474 to be carried forward.

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FINANCIAL REPORTS AND MEETINGS.

SHANGHAI ELECTRIC CONSTRUCTION COMPANY have declared a first interim dividend of 6 per cent., less tax.

MADRAS ELECTRIC TRAMWAYS.—An interim dividend has been declared at the rate of 6 per cent. per annum.

BROWETT, LINDLEY AND COMPANY.—An interim dividend of 6 per cent. on the preference shares and 4 per cent. on the ordinary shares, less tax, were declared.

BRITISH ALUMINIUM COMPANY.—A dividend was announced at the rate of 5 per cent. per annum on the ordinary shares, less tax, for the six months ended June 30.

G. D. PETERS AND COMPANY, LIMITED.—A dividend at the rate of 6 per cent. per annum, less tax, on the preference shares for the quarter ended September 30 has been announced.

BRUCE PEEBLES AND COMPANY have declared a dividend at the rate of 7½ per cent. per annum, less tax, on 7½ per cent. cumulative participating preference shares for the half-year ended June 30, 1921.

LANCASHIRE ELECTRIC LIGHT AND POWER COMPANY.—The subscription list for the issue of 400,000 7½ per cent. prior lien debenture stock was opened on September 19 and closed the same morning.

RANGOON ELECTRIC TRAMWAY AND SUPPLY COMPANY, LIMITED.—The balance of the ordinary share capital of the company, amounting to 72,999 ordinary shares, recently offered for subscription at par, has been duly allotted.

BRITISH INSULATED AND HELSBY CABLES, LIMITED.—An interim dividend of 9d. per share on ordinary shares for the half-year ended June 30, less tax, was declared. Last September the interim dividend was at the same rate.

BARSI LIGHT RAILWAY.—A dividend has been announced of 3 per cent., together with a bonus of 4 per cent. (14s. per share in all), making a total distribution of 12 per cent. for the year ended March 31. The distribution for the previous year was the same.

DUMBARTON BURGH TRAMWAYS.—Dumbarton Burgh and County Tramways Company announced a dividend on preference shares of 3 per cent., but passed the dividend on the ordinary shares. After appropriating £2,125 for the redemption of debenture stock and sinking fund, the amount of £1,412 is carried forward.

BOLCKOW, VAUGHAN AND COMPANY'S accounts for the year ended June 30 last show a heavy fall in profits, the amount being £315,067, which compares with £380,357 in the previous year. A final dividend of 4 per cent., less tax, was declared on the ordinary shares, making 8 per cent. for the year, against 12 per cent., and the sum of £203,507 is carried forward.

THE CANADIAN GENERAL ELECTRIC COMPANY have declared a quarterly dividend of 2 per cent. for the three months ending September 30, 1921, being at the rate of 8 per cent. per annum on the common stock, and a half-yearly dividend of 3½ per cent. for the six months ending September 30, 1921, being at the rate of 7 per cent. per annum on the preference stock.

PRESTON CORPORATION TRAMWAYS.—In his report for the year ended March 31, 1921, the engineer and manager (Mr. J. F. Simpson) states that for the first time in the history of the undertaking the accounts show a loss on the year's operations. The result of the increase in fares in November, 1920, has, however, been satisfactory, and if maintained, it is expected that the present year's expenditure will at least be covered. There was a gross profit on the revenue account of £11,023, and after deducting the usual charges and allowing for £1,739 brought forward from last year, there remains a debit balance of £6,806. The car mileage was 1,209,867, as compared with 1,160,854 for the previous year; the number of pasesngers carried was 15,885,352, against 15,738,087, and the average traffic revenue per car mile was 18·97d., against 18·30d. (N.B.—These figures correct those which erroneously appeared in our issue of July 9.)

OLDHAM CORPORATION TRAMWAYS.—According to the report of the general manager and engineer (Mr. W. Chamberlain) for the year ended March 25, 1921, the financial results for this period again constituted a record. The total receipts amounted to £250,741, as compared with £237,408 for the previous year, while the working expenses (inclusive of energy) were £202,235, as against £168,648. The gross profit was £48,506, and after allowing for establishment and other charges, there is a net profit of £5,064. There has been no alteration of fares and stages during the year. A loss of £259 was experienced on the parcels department. The number of passengers carried was 32,071,037 as compared with 31,816,891 in 1920; the car mileage was 2,202,868 as against 2,124,755, and the percentage of working expenses to receipts 80·65 against 71·04. The average traffic revenue per car-mile was 26·760d., as compared with 26·508d., and the average working expense per car-mile (including power cost) was 22·033d. against 19·049d.

BRADFORD CORPORATION TRAMWAYS.—It was decided by Bradford Tramways Committee, on October 3, that if the Parcels Department, which involved a loss during the last financial year of £4,271, is not paying by March next it will be closed. The cause of the deficit was stated in the annual report to be the large amount paid in messengers' wages, which it has now been decided to reduce. The annual report of the general manager (Mr. R. H. Wilkinson), to which we have previously alluded as regards the railless trolley vehicles, states that the year showed a record yield of income on the whole undertaking, but the increase in receipts was not sufficient to meet the increased expenditure. The gross profit was £64,636, but after deducting the customary charges and making provision among other items for sinking fund (£32,617), there remained a deficit of £22,245. The average total revenue per car mile was 27·168d., against 25·876d. for the previous year. The number of passengers carried was 88,865,557, as compared with 86,469,014, and the total car mileage 6,347,404, as against 5,648,370.

NEWCASTLE CORPORATION TRAMWAYS.—In his annual report for the year ended March 31, 1921, Mr. Ernest Hatton, engineer and general manager, states that the gross revenue amounted to £595,914, as compared with £504,053 in the previous year. The gross profit, before providing for interest redemption, and depreciation, amounted to £81,302, as against £81,838. After contributing to the rates £15,471, there was a balance of £4,034, as compared with £1,404 in the previous year. The passengers carried were 98,840,657, a decrease of over 3,000,000. Mr. Hatton calls particular attention to the heavy expenditure, amounting to £90,796, out of the reserve and renewals fund. This expenditure was largely incurred for work which could not be dealt with during the war period. This fund now stands at £66,218, and Mr. Hatton says that it will require to be steadily built up again and this can only be done by a reduction in working expenses as the limit of receipts from the present fares has now been reached. The anticipations as to the result of the revision of fares during the year have been fulfilled, as an additional income of £80,000 was obtained. The increased cost of wages and materials, however, outstripped the increase in revenue.

COVENTRY CORPORATION TRAMWAYS —In his annual report for the year ended March 31 last, the general manager and engineer (Mr. T. R. Whitehead) recalls that the year was an abnormal one in many respects. The number of passengers carried continued to decrease, owing to trade depression, and in an endeavour to meet higher costs and decreased revenues, the 1d. minimum fare was increased to 1½d. in May, 1920, and to 2d. in October. The increased revenue derived, however, was not sufficient to meet the additional cost of operation for the year. Whereas working costs increased 211·6 per cent. over the pre-war period, fare charges only increased 100 per cent. to passengers travelling one stage, and 50 per cent. to passengers travelling further. The total tramway receipts amounted to £100,431, or 23·102d. per car-mile, as against £89,393 or 20·308d. per car-mile in the previous year, an increase of £11,037 or 12 per cent. The working expenses were £90,735, an increase of £12,276. The receipts from the omnibuses totalled £23,964, and the working expenses £17,462. The result is a deficit on the whole undertaking for the year of £13,514. The tramcar miles run were 1,043,344, as compared with 1,056,443 for the previous year, a decrease of 13,099 miles. Passengers carried by the cars numbered 12,192,645 as against 15,094,905, a decrease of 2,902,260, and the omnibus passengers numbered 2,286,017. Considerable track reconstruction and doubling of the permanent way was carried out.

LEEDS CITY TRAMWAYS.

DEFICIT OF £6,000 REPORTED.

A report recently presented to the Leeds Tramways Committee by the general manager, Mr. J. B. Hamilton, for the five weeks (35 days) ended August 31, 1921, shows a deficit of £6,905 compared with the same period last year. A summary of the aggregate income and expenditure for the twenty-two weeks ended August 31, 1921, compared with the results for the same period last year, shows a deficit of £36,634, or 2·335d. per mile. The figures for the period as compared with those for the similar period last year are appended—

	From April 1 to August 31, 1921.		Corresponding period last Year.		Increase or Decrease.	
		Per Mile. d.		Per Mile. d.		Per Mile. d.
Income	£410,548	26·170	£420,825	23·443	−£10,277	+2·727
Expenditure ...	£447,182	28·505	£422,688	23·547	+£24,494	+4·958
Deficit	−£36,634	2·335	− £1,863	·104	+£34,771	+2·231
Deficit Average per day	− £239		− £12		+ £227	
Passengers carried	53,946,592		59,279,437		−5,332,845	
Car Miles Run ...	3,765,018		4,308,281		−543,263	
No. of days included	153		153			

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TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDEEN.

JURY AND CAR STOPPING-PLACES—TRAMWAY RECONSTRUCTION.

At the inquest on a retired stationmaster, who was killed by a motor omnibus when about to board a tramcar, the jury returned a formal verdict, adding that no criminal responsibility rested on the driver of the omnibus. They recommended that the Corporation should consider the question of altering tramway stations so as not to have them placed opposite side roads where there was insufficient room for overtaking traffic to pass on the proper side. The Tramways Committee have approved schemes of work to a total cost of £83,000 with a view to relieving the unemployed. The plans, which are expected to afford work for about 350 men for varying periods, include—Reconstruction of double line, Brighton Place to Mannofield, at a cost of £18,000; doubling the present line from Queen's Cross to Bayview (£18,000); reconstruction of Union Street double line (£30,000); abolition of the bodies of all single-deck cars and utilisation of the trucks for building new double-deck vehicles. This will involve overhauling the trucks and renewal of the electrical equipment. Eight cars will thus be reconstructed at a cost of £1,200 each. It is also proposed to give permanent employment to 22 temporary hands by augmenting various services.

BELFAST.

SUCCESSFUL TRAFFIC INDUCEMENT.

The general manager of the city tramways (Mr. J. S. D. Moffet) has reported to the Tramways Committee that the engagement of the Royal Horse Guards Band at Bellevue, the magnificent pleasure ground owned by the tramway department, had proved a great success, large numbers of the public being led to visit the park, which can be reached by tramway from all parts of the city.

BIRMINGHAM.

RAILLESS SCHEME APPROVED—NEW TRAMWAY TERMINUS—LIGHT RAILWAY ORDER EXTENDED.

The Minister of Transport has informed the Corporation that he will raise no objection to the proposed experiment with railless vehicles (with which the Corporation intend to replace the tramway service on the Nechells route), if in their next Parliamentary Bill they will include the clause authorising the running of such vehicles. The Corporation has already placed an order with Railless, Limited, for 12 cars. As an alternative to the present terminus of the Corporation Tramways in High Street, which has often been criticised as unsatisfactory, the construction of a new terminus has been commenced. This will involve the widening of Henn's Walk, and the laying of a new stretch of track along Moor Street, from Albert Street, and via Henn's Walk to Dale End. With the exception of cars from Bordesley Green, all cars now having their terminus in High Street will proceed via the new lines to Dale End. At this point, a short distance from the High Street corner, a large covered shelter will be erected, divided by barriers for the various routes. The Bordesley Green cars will be the only ones using the Albert Street route; their terminus will be Martineau Street. Birmingham Corporation Light Railway Order, 1912, has been extended by the Ministry of Transport for one year from September 6, 1921. The order was previously extended by an order of the Board of Trade on July 28, 1915, and provided for extension of the period limited by the Birmingham Corporation (Quinton) Light Railway Order, 1913, for the purchase of lands and the completion of works. The Corporation have again decided to postpone the construction of the light railway to Quinton.

BRADFORD.

REPORT ON RAILLESS TRACTION—EXAMINATION TESTS OF TRAFFIC MEN.

Mr. R. H. Wilkinson, general manager of the Corporation tramways thus reviews the railless trolley developments at Bradford in his annual report for the year ended March 31, 1921. The income earned was £21,384, or 13·243d. per car-mile, and the working expenses amounted to £33,226, or 20·576d. per car-mile, as compared with 15·660d. in the previous year. The traffic expenses were 9·618d. (against 7·818d.), general expenses 1·345d. (against 1·001d.), general repairs and maintenance, 7·787d. (against 5·147d.), power expenses at 1½d. per unit, 1·821d. (against 1·694d.), allowance to soldiers, ·005d. The present vehicles have practically run their useful life, and will be superseded with vehicles of a more modern type. A double deck top-covered railless vehicle, with a seating capacity for 51 passengers, which was constructed at the Thornbury Tramway Works, and was placed in service on November 6, 1920, had run 15,453 miles up to the end of the financial year, with an average current consumption of 1·685 units per car-mile. The Ministry of Transport has approved the department's design of the one-man railless trolley vehicle, and it is intended that this type shall gradually supersede those which have two men in charge. Permission has been obtained from the Ministry to operate experimentally a double deck top-covered railless vehicle having a seating capacity for 57 persons. Application was made on January 6, 1921, for permission to operate double deck top-covered railless vehicles on the Eccleshill, Idle and Thackley sections, with a view of avoiding the enormous capital outlay necessary for the renewal of the permanent way on these sections. In reply, the Minister pointed out that they had no power to authorise the running on the routes in question of railless trolley vehicles of the weight proposed. The Roads Bill, in which the taxation of vehicles is based upon the seating capacity, brings an additional expense on railless vehicles, but this supersedes the charge of ⅜d. per mile previously made in respect of road maintenance. Acting on a recommendation of the Ministry of Transport, the Tramways Committee have decided to test by examination every 12 months the qualifications of men employed on traffic service.

BRISTOL.

PRESENTATION TO POPULAR FOREMAN—AUTOMOBILE MANUFACTURERS' VISIT.

A presentation was made on September 4, at a largely attended meeting of foremen and inspectors of the Bristol Tramways and Carriage Company, to Mr. F. E. Adams, a popular foreman, who is retiring after 32 years' service. The gift took the form of a marble clock, which was handed to Mr. Adams by the manager, Colonel S. E. Smith, C.B.E., who spoke highly of the recipient's notable record. Mr. Adams, who is 60 years of age, assisted in training some of the first London electric tramcar drivers. The Brislington works of the company were among those in Bristol and district visited by the delegates to the recent conference of the Institute of British Carriage and Automobile Manufacturers. The delegates were much impressed with the fine equipment of the manufactory, and were afforded an opportunity of watching processes in the constuction of some of the vehicles for which the firm are noted.

DEARNE VALLEY.

NEW LIGHT RAILWAY.

A commencement is being made with preparations for the construction of the Dearne Valley Light Railway, the necessary powers having been conceded. Contracts have to be prepared, and various preliminary negotiations conducted, especially in connection with road widenings.

DONCASTER.

TRAMWAY DEVELOPMENT SCHEME.

At a meeting of the Town Council on September 13, Alderman S. Balmforth (chairman of the Electricity and Tramways Committee) moved that application be made to the Ministry of Transport for sanction to the construction of a light railway connecting the tramway in Frenchgate with the tramway in St. Sepulchregate. He said that a little while ago the Highways Committee drew the attention of the Tramways Committee to the fact that Trafford Street was to be taken over as a highway, and suggested that if the Tramways Committee intended to put down a tramway there, it would be well to have it done before the highway was made. The committee felt that they should at once proceed with the full scheme which had been discussed, and connect the St. Sepulchregate and Frenchgate tramways. The proposed extension of the tramway through Trafford Street, etc., would give a circular route and do away with the dangerous terminus at the junction of Frenchgate and North Bridge Road for the Brodsworth and Bentley cars. The cost would be about £10,000, but the work would all be of a permanent character. The resolution was carried.

DOVER.

CHEAP TICKETS FOR CHILDREN.

The Tramways Committee have decided, as an experiment, to issue return tickets at half price for the 1½d. stages to children between four and twelve years of age. This, it was stated, would probably stimulate traffic during the slack hours, especially during school holidays. The present arrangement for scholars only, up to 16 years of age, continues in force.

EAST HAM.

TRAMWAYS FINANCIAL POSITION.

The report of the inquiry into the financial position of the East Ham Corporation tramway and electric light combined undertakings, which was conducted by a committee of the Borough Council, has been issued. The committee were satisfied that, bearing in mind (1) the fact that the undertaking was the first combined electric lighting and tramway system opened in the Metropolis, and (2) the difficulties of the war period and the economic situation which was the outcome thereof, the engineer and manager (Mr. W. C. Ullmann) had done everything possible to maintain and to increase efficiency, and that the financial situation has been caused by circumstances largely uncontrollable by either the manager or the Council. They look forward to economies in the cost of coal and in the wages bill, should the cost of living continue to fall. At a meeting of the Council last week, the Finance Committee

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recommended that the deficiency on the tramways undertaking (£34,026) be partly met by the sum of £34,000 already provided in the estimate of the borough rate for the year ending March 31, 1922, and that the difference (£26) be carried forward to the ensuing year. This was agreed to.

EDINBURGH.

PROVISION OF FARES AND STAGES.

The general manager of the Corporation Tramways (Mr. R. S. Pilcher) has submitted a scheme to the Tramways Committee which will give an appreciable extension of most of the present 1d. and 2d. stages. Hitherto, the length of the average 1d. stage has been 941 yards, and it is proposed that this shall be increased to an average of 1,127 yards. Passengers will be able to travel along Princes Street for 1d. instead of 2d. The average distance of a 2d. stage will also be extended.

GLASGOW.

TRAMWAY EXTENSIONS—MEN'S WAGES REVIEWED.

In a report to the Corporation Tramways Committee in September, the general manager (Mr. J. Dalrymple) dealt with various prospective extensions. At present, he said, the Corporation had Parliamentary powers to construct between 18 and 19 miles of double track, in addition to the Clarkston extension, which was nearing completion. The Canniesburn extension was being proceeded with as quickly as possible; the new road through the field at Canniesburn Toll was almost ready for the tramway track. It has not been possible owing to the need for sewers and other work coming first, to proceed with the extensions at Craigton Road, Anniesland Road and Crow Road. Of the remaining four proposed extensions—Milngavie, Millerston, Coatbridge, and Provanmill—only the last-named had actually been started. Negotiations were proceeding with the county authorities regarding Milngavie and Millerston. If the county authorities of Dumbarton let the committee know their requirements, there should not be much difficulty in the case of Milngavie. The extension to Millerston, however, would be delayed, as a new bridge would be required across the canal at Riddrie. The Corporation decided to reduce the war bonus of the tramway employees by 3s. per week as from the first pay day in October and to continue to the last full weekly payment in November, when the position would be reviewed. The local members of the Vehicle Workers' Union discussed the matter, when the report of a deputation appointed to meet the Wages Committee was considered. A resolution was adopted approving the recommendation of the Wages Committee with the reservation that whatever alteration took place in November should be based upon the national agreement for the tramway industry. This is based upon a sliding scale in accordance with the cost of living figures.

HALIFAX.

PRE-WAR SUNDAY SERVICE RESTORED.

The Tramway Sub-committee are reintroducing the pre-war Sunday services. By this arrangement the first cars leave the town for the outer termini about 1 p.m., or an hour earlier than hitherto.

LEEDS.

TRAMWAY JUBILEE.

The tramways attained their jubilee on September 16, the service having been opened on September 16, 1871, when cars ran from Boar Lane to Headingley. That line was followed by the construction of others from Boar Lane to Chapeltown, Marsh Lane, Hunslet and Kirkstall. Horse cars were succeeded in 1877 by steam cars, and electric traction was first installed in Leeds on the Roundhay line in 1891. In 1894 the Corporation purchased the undertaking, and two years later began the electrification of the system. The first line equipped ran from Roundhay Park to Kirkstall, via Boar Lane. This was completed in July, 1897, and was the first municipal electric tramway constructed in this country.

LONDON.

REPORT ON ACCIDENT TO METROPOLITAN RAILWAY TRAIN.

Colonel J. W. Pringle, an inspector of the Ministry of Transport, has presented his report on the collision on July 8 at Wapping Station on the East London Railway. Five vehicles, detached from the rear of a Great Eastern goods train (steam worked) from New Cross (G.E.) to Whitechapel, collided with the front of the following Metropolitan Railway electric passenger train from New Cross (S.E.) to Shoreditch, just as the latter had commenced to leave Wapping Station. The motorman of the electric train and a G.E.R. goods guard were killed, and fourteen passengers and two guards were injured. The inspector considers that the working of unfitted trains, on a line with gradients of this character, interspersed between a frequent service of electric passenger trains, is attended with risk of accident from breakaways.

MANCHESTER.

TRAMWAY EMPLOYEES' UNFORTUNATE DECISION.

The Corporation tramway employees have rejected the proposal of the general manager (Mr. J. M. McElroy), whereby the shed workers would have been employed for shorter hours to obviate the necessity for the dismissal of 30 cleaners. Mr. McElroy met representatives of the United Vehicle Workers' Union in conference on the matter and the cleaners' notices were suspended, but without effect. This reduction of staff was necessitated as part of a policy of economy which has obtained in the department for some time. Mr. McElroy has stated that the men's attitude is a disappointment to the management. If they had agreed to the scheme, which would have only meant the loss of half a day a week, the 30 surplus men could have been retained.

NEWCASTLE-ON-TYNE.

WAGE REDUCTION PROPOSED.

A sub-committee of the Transport and Electricity Committee have agreed, subject to the approval of the parent committee, to effect reductions in the wages of the operating staff of the tramways. Considerable economy in expenditure is considered necessary to keep the system going. Hitherto the men have strongly resented any such proposal, which they regarded as a breach of the Industrial Council's agreed scale of Wages.

PLYMOUTH.

TRAMWAYS RECONSTRUCTION.

The Corporation Tramways Committee have decided to apply to the Ministry of Transport for sanction to borrow £28,000 to enable part of an extensive scheme of reconstruction of the system to be put in hand. A sum of £14,000 would be spent on the relaying of track, and a similar amount on new car bodies and new electrical equipment. Mr. H. P. Stokes, the general manager, also recommends the centralisation of administration and works on the Milehouse site and an extension of the depot costing about £3,500. The committee have considered the report of the engineer on the termination of the lease of Plymouth, Stonehouse and Devonport Tramways on June 30 next. They decided to apply to the Ministry of Transport for approval of the plans for work in connection with the linking up of the tramways, and for sanction to borrow £4,000 for this purpose.

SALFORD.

END OF TRAMWAY STRIKE.

The operation of the Corporation Tramways was resumed on Saturday, September 17, after having been suspended from the previous Monday, in consequence of a strike of most of the employees. It will be recalled that the cause of the dispute was the secession of a number of inspectors and traffic clerks from the United Vehicle Workers' Union, in order to join the National Association of Local Government Officers, an action which the men resented. Persistent efforts were made by the Mayor (Ald. F. Hampson) and the chairman of the Tramways Committee (Ald. W. H. Barrett) to effect a settlement, and at a conference over which the Mayor presided on Friday, September 16, a settlement was reached on the following terms—

It is mutually agreed—(1) That the inspectors are still members of the society. (2) That the present position has arisen owing to dissatisfaction on the part of the inspectors regarding their position in the society, which dissatisfaction culminated in the inspectors proposing to leave the United Vehicle Workers. (3) That the present dispute be terminated immediately without prejudice. (4) That the present negotiating committee of 12 shall at once proceed to consider the whole question with a view to arriving at a satisfactory settlement. (5) That the inspector members shall resume payment of contributions to the union as from September 23, 1921. (6) That failing the committee coming to a satisfactory conclusion in the matter, the question of whether the inspectors shall remain in the union be submitted to arbitration. It was estimated that the strike cost the Corporation approximately £5,000 and the men and their trade union almost £1,900. The members of the Salford No. 1 Branch of the United Vehicle Workers have tendered sincere thanks to the Mayor of Salford for his successful efforts in bringing about a settlement.

WALSALL.

THROUGH SERVICE WITH WOLVERHAMPTON.

The Tramways Committee have instructed the tramways manager to negotiate with Wolverhampton Corporation and the Wolverhampton District Electric Tramways, Limited, for a through service between Walsall and Wolverhampton. The conversion of the Wolverhampton Corporation Tramways from the Lorain surface contact to the trolley system will facilitate inter-running.

YORK.

COST OF RAILLESS CARS.

It is stated that the running costs of railless cars of the Corporation amount to 1s. 7d. per car-mile, including capital charges. The cost for energy, solid rubber tyres and wages is 11½d. per car-mile. Energy consumption amounts to 1·42 units per car-mile and current is supplied from the Municipal power station at 2d. per unit. The cars, which were supplied by Railless, Limited, are, it will be remembered, of the single deck type and seat 24 passengers.

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PERSONAL.

Councillor E. H. Privett has been appointed vice-chairman of Portsmouth Corporation Tramways Committee, an office rendered vacant by the death of Alderman R. Payne.

Captain H. J. Groves-Webb has been appointed by Johnson and Phillips, Limited, as engineer and branch manager of their London branch at 12, Union Court, Old Broad Street, London, E.C.2.

Mr. Wm. Wyld, borough electrical engineer and manager of Hampstead electricity department, has resigned in order to join the Spearing Boiler Company, of 11, Queen Victoria Street, London, E.C.

Professor G. W. O. Howe, assistant professor of electrical engineering at the City and Guilds Engineering College, has been appointed superintendent of the electrical department of the National Physical Laboratory.

Mr. H. J. Wilson, C.B.E., has been appointed by the Minister of Labour to be permanent secretary to the Ministry, in succession to Sir James Masterton-Smith, who has been appointed Under-Secretary for the Colonies.

Mr. C. W. Mallins, late general manager of Liverpool Corporation tramways and omnibuses, who recently accepted a seat on the board of the Samuelson Transport Company, Limited, has now been appointed joint managing director.

Mr. N. J. Young, M.B.E., general manager of the Electricity and Tramways Department of Newport (Mon.), has been appointed to control the Cleansing and Haulage Departments of the Corporation, which include all motor and electric vehicles.

Mr. S. Ratcliffe, chairman of the Works Committee of Metropolitan-Vickers Electrical Company, addressed a conference held under the auspices of the Industrial League and Council on "Works Committees." That over which he presides was one of the first inaugurated.

The death has occurred of **Mr. Arthur A. Day,** at the age of 57 years. Appointed electrical engineer of Bolton Corporation in 1900, he assumed the management of the tramways in 1904 and controlled both departments until September, 1912, when owing to ill-health he resigned both positions.

Mr. J. Y. Mackersie, resident engineer of the Summer Lane power station of the Birmingham Corporation, has resigned to accept an important appointment in Calcutta. Mr. Mackersie has been on the Birmingham staff for the past 15 years and has been presented with a canteen cabinet by the technical staff. The chief engineer, Mr. R. A. Chattock, made the presentation.

Mr. F. Ayton.—On September 13 the employees of Ipswich Corporation electricity and tramways department presented to Mr. Frank Ayton, on his retirement from the post of chief electrical engineer and tramways manager, which he has occupied for the past 18 years, a handsome leather-bound illuminated volume, containing the signatures of the employees of the various departments, numbering 300 in all. Mr. T. W. Wilkinson, accountant, who presided, and other officials, expressed their regret at the departure of Mr. Ayton. In acknowledging the gift, Mr. Ayton said he looked upon the volume not only as a message from the givers, but as a human document of far more value than anything they could have given to him in the way of intrinsic worth. They would understand that it was something of a wrench leaving them, but the offer he had received was put in such a way that he found it impossible to refuse it. In Mr. Black, who came with a fine record from Southport, he assured them they would find a personal friend, and he was certain that Mr. Black could not find a more loyal and dutiful staff. He thanked them all for the loyal and willing service they had always given to him in the past.

CONTRACTS AND ORDERS.

Thornycroft Tipping Waggons for Calcutta.—Calcutta Municipal Council have decided to purchase six 5-ton hand-operated side-tipping trailers from Messrs. Thornycroft's.

Newcastle City Council have placed an order for a 4,000-K.W. turbo-alternator and surface condensing plant for the Manors station with C. A. Parsons and Company, Limited. The amount of the contract is £33,700.

The Westinghouse Electric International Company has announced that it has received from the Imperial Government of Japan an order for two electric freight locomotives to be used in Tokio, and the vicinity. The machines weigh 62 tons, have a capacity of 1,000 H.P. each, and work on direct current at 1,500 volts.

Erith Urban District Council have placed the following contracts—Power station switchgear, £551; cubicle, £180 (English Electric Company). Sub-station equipment, £293 (Metropolitan-Vickers Electrical Company). Transformers, £4,747 (British Electric Transformer Company). Three-core cable, lead sheathed and steel armoured (approx.), £2,500 (Callender's Cable, etc. Company).

BUSINESS NOTICES.

FIRE-EXTINGUISHING DEMONSTRATION.—An interesting demonstration of the rapid extinguishing of fire by means of chemically-charged appliances was carried out at Wandsworth by Foamite Firefoam, Limited, of 65 South Moulton Street, London, W.

CHRISTOPHER DODSON, LIMITED, owing to the expiration of lease, have closed their works at 81 Page Street, Westminster. The whole of their business is now carried on at Cobbold Road, Willesden, N.W.10. (Telephones—Willesden 1630 and 1631. Telegraphic address—"Ceedolim, Willroad, London.")

SIR CHARLES BRIGHT AND PARTNERS.—A partnership is announced under this style between Sir Charles Bright, M.Inst.C.E., M.I.E.E., M.Inst.T. &c.; Mr. A. Hugh Seabrook, M.I.Mech.E., M.I.E.E., consulting engineer (late chief engineer and general manager to the St. Marylebone and other electric supply undertakings); Mr. A. J. Stubbs, M.Inst.C.E., M.I.E.E. (late assistant engineer-in-chief H.M. Post Office); and Lieut.-Col. H. W. Woodall, C.I.E., M.Inst.C.E. (director and consulting engineer of gas and water companies), as consulting engineers, with offices at 146 Bishopsgate, E.C.2.

THE ENGLISH ELECTRIC COMPANY OF CANADA, LIMITED, has recently been registered. The company will have the use of all patents, designs, and processes of the English Electric Company, Limited, of Great Britain, and the exclusive manufacturing rights for Canada in perpetuity. It will act as the agent through whom all selling, engineering, and construction work in Canada is done, and holds the right of selling its own products in the United States. The Canada Company has also working arrangements with the Siemens Manufacturing Company, Limited, and the English and Siemens Supplies, Limited.

UNITED COUNTIES ROAD TRANSPORT.—United Counties Omnibus and Road Transport Company was registered September 1 with a capital of £100,000 in £1 shares (50,000 8 per cent. cumulative participating preference and 50,000 ordinary) to take over from the Wellingborough Motor Omnibus Company 37 running omnibuses and other vehicles, a garage at Irthlingborough with chassis erecting and body building shops, and freehold cottages and other properties. The minimum cash subscription is £50,000. The first directors are J. O'Connor, 5, Frognal Mansions, Hampstead, N.W.; J. J. Johnson, "Belmont," Wellingborough; H. C. Merrett, 41 Finsbury Square, E.C.; W. B. Richardson, Rockingham House, Kettering (managing director, Wellingborough Omnibus Company); C. E. Woolstan, 1 High Street, Wellingborough. The secretary is J. J. Johnson, and the registered office at 1 High Street, Wellingborough.

M.T.A. STANDARD FITTINGS.

We have been asked by Messrs. Brecknell, Munro and Rogers, Limited, of Bristol, to announce that owing to the large number of inquiries received at the exhibition held recently at Olympia, they have arranged a permanent exhibition of all their tramway and industrial fittings in London. The exhibits are shown in the offices of their sole selling agents, the Peckham Truck and Engineering Company, Limited, 26-29 Audrey House, Ely Place, Holborn, E.C.1, and an invitation is given to everyone interested to inspect these fittings. The exhibit includes a complete set of the Municipal Tramways Association's standard fittings, all of which can now be supplied from stock.

NEW CANADIAN BRILL COMPANY.

J. G. Brill Company, Philadelphia, announces the formation of a new company for the sale and construction of electric and steam railway rolling stock in the Dominion of Canada. This new company, which is styled the "Canadian Brill Company, Limited," has taken over the equipment of the Preston Car and Coach Company, Limited, Preston, Ontario, and has a number of orders now in hand.

This plant is a modern car manufactory, having 11½ acres of ground in the outskirts of the city. Railway facilities for the shipment of its products to all parts of Canada are provided by the Grand River and Grand Trunk Railways.

The executives of the "Canadian Brill Company, Limited" are—Samuel M. Curwen, president; H. K. Hauck, first vice-president; Alfred Clare, second vice-president; H. D. Scully, general manager and secretary; and E. P. Rawle, treasurer.. Mr. Scully, who has been officially identified with many important Canadian enterprises, is located in Preston and, as the resident manager, will direct the operation of this new Brill plant.

J. W. Courtenay, Ltd., Amberley House, 12, Norfolk Street, Strand, W.C.2, have been appointed advertising Agents for St. Helens Corporation Tramways and Stockton-on-Tees Corporation Motor Omnibus Department.

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PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Springing systems for vehicles (22,974)—Associated Equipment Company and C. K. Edwards.
Indicating apparatus for vehicles (23,500)—J. Bayard and F. F. Dowdall.
Variable speed gearing for motor vehicles (22,824)—W. B. Bowden and J. Stokoe.
Device for facilitating steering of motor vehicles (23,074)—J. Brierley.
Motor vehicle suspension (23,353)—O. R. Dunnet.
Fish plates, etc., for rails (23,347)—D. Faulkner.
Safety indicator for vehicles (23,189)—P. J. Horan.
Means for operating variable gear of motor vehicles by engine-power (23,183)—E. Lewis.
Electrically-operated brakes for self-propelled vehicles (23,404)—W. Paddon.
Motor vehicles (23,326)—T. Westall and A. Woodhead.
Means for stopping rail or track vehicles (23,933)—H. Bremner.
Trolley heads for tramcars, etc. (24,076)—C. P. Ellis.
Guards for road vehicles (24,141)—E. Parker.
Anti-splash and non-skid devices for motor vehicles (23,843)—A. Tomlins.
Motor vehicles (23,615)—H. W. Tomlinson.
Drive of motor vehicles (24,567)—R. B. Adamson and H. Richards.
Change-speed gearing for motor vehicles (24,189)—A. Alderson.
Omnibus bodies, etc. (24,249)—C. B. P. Ball and G. H. Milton.
Motor vehicles (24,181)—A. Collier and L. W. Plater.
Weather screens for omnibuses (24,740)—G. A. J. Hopkins.
Trolleys for overhead conductor electric tramways (24,502)—W. Lawrance.
Clamps for electric trolley conductors (24,206)—Metropolitan-Vickers Electrical Company, Limited.
Electric traction systems (24,332)—Metropolitan-Vickers Electrical Company, Limited.
Lifting jacks (24,540)—C. W. Perkins.
Motor vehicle, etc., power transmission mechanism (24,411)—P. O. Rowlands.
Variable speed gearing for motor vehicles (24,470)—C. S. H. Snow.
Driving gear of tramcars (25,272)—Sir J. A. F. Aspinall and English Electric Company, Limited.
Springing systems of vehicles (25,069)—Associated Equipment Company, Limited, and C. K. Edwards.
Automatic safety guard for front of motor vehicles (24,779)—L. W. Baggott, E. W. Gilbey and A G. Spence.
Motor vehicles (25,281)—H. B. Barwise.
Bodies of trackless tramway cars (24,968)—G. A. Bishop and R. A. Chadwick.
Flat-footed track-rail chairs, anchor plates, etc. (24,956)—G. H. Cowen.
Reversible seats in tramcars, etc. (24,743)—F. Evans and J. Evans.
Lifting jack for vehicle wheels (24,914)—S. Hall.
Trolleys for electric vehicles (25,348)—D. M. Hutchinson and J. Spowart.
Trolley heads for tramcars (24,780)—M. A. Klauck.
Rail joint (24,770)—H. W. Lundin.
Sockets or bases for trolley poles for electrically-propelled vehicles (24,782)—E. M. Munro.
Apparatus for distribution of sand on tramway rails (25,334)—J. Murray.
Current-collecting trolleys on tramcars, etc. (25,097)—B. Shores.
Life-saving apparatus for motor cars (25,196)—W. G. Styles.
Life-saving device for motor vehicles (25,957)—D. Bari.
Mechanical means for starting engines of motor vehicles (25,706)—H. J. Beckett and C. H. Kelly.
Lighting systems of electric tramcars (25,658)—H. A. Black and D. B. Russell.
Apparatus for preventing motor vehicles running back (25,432)—W. J. Dickinson.
Means for steering motor vehicles (25,823)—W. Laffan.
Transmission mechanism for motor vehicles (25,826)—Maybach-Motorenbau Ges.
Apparatus for indicating position of trolley poles and pulleys of electric tramways (25,629)—E. P. Naish.
Motor vehicle power transmission mechanism (25,828)—P. O. Rowlands.
Motor vehicles (25,529)—E. B. Smith.

SPECIFICATIONS PUBLISHED 1920.

Guard for motor vehicles (6,779—*167,208*)—A. E. Guppy.
Internal combustion engines for motor vehicles (11,811—*167,237*)—J. Maina.
Motor road vehicles (15,332—*167,353*)—F. J. Camm and G. A. Broomfield.
Supporting stays for the platforms of tramcars, etc. (17,409—*167,363*)—F. Lee, E. Spencer, and W. Matthews.
Braking mechanism (19,493—*147,561*)—Compagnie Internationale De Freinage Systeme Luyers Soc. Anon.
Trolleys for electric tramways of the overhead conductor systems (21,231—*167,374*)—W. Lawrance.
Electrically-driven vehicles (21,341—*167,375*)—F. M. Walters.
Motor vehicles (5,110—*167,518*)—F. C. Blake.
Controlling devices for vehicles (10,115—*167,535*)—W. L. Spence.
Steering gear for motor road vehicles (12,766—*167,566*)—M. Brown.
Electrically-operated motor vehicles (13,327—*146,935*)—Hansa-Lloyd Werke Akt.-Ges.
Undercarriages of power-propelled vehicles (13,975—*167,616*)—F. W. Lanchester.
Trolley wheels for overhead electric traction (24,046—*150,284*)—J. Jaussaud.
Steering devices for motor vehicles (35,725—*156,580*)—M. J. B. Barbarou.
Direction and turning indicators for road vehicles (12,572—*167,817*)—A. Wheaton.
Motor vehicles (14,041—*143,571*)—Maybach Motorenbau Ges.
Rail chairs and method of securing the rails therein and locking the tie-bars therefor (14,341—*168,151* and 29,704—*168,543*)—L. Green.
Motor car radiators (14,381—*168,153*)—G. Morris and E. W. Hinton.
Rear axle for motor vehicles (15,511—*151,241*)—Oesterreichische Waffenfabriks Ges.
Jacks (17,375—*146,198*)—H. Wyman.
Life-guards for motor vehicles (14,888—*168,410*)—E. J. Buckingham.
Tramcar fenders (15,933—*168,441*)—O. G. Jones.
Motor vehicles (16,902—*154,876*)—Fiat. Soc. Anon.
Change-speed gearing for motor vehicles (18,418—*168,475*)—B.S.A. Cycles, Limited, and H. Poole.
Construction of joint for tram rails (33,418—*168,550*)—G. Wardle.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	Sept. 4	Sept. 11	Sept. 18	Sept. 25	Oct. 2	Sept. 3	Sept. 10	Sept. 17	Sept. 24	Oct. 1	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Aberdeen Corporation	4,367	4,175	3,846	3,678	3,930	3,903	4,258	3,585	3,552	3,586	17½	66,217	− 6,834
Aberdeen Motor Buses	60	58	40	26	33	293	248	229	211	261	17½	6,367	+ 5,612
Ayr Corporation	816	795	1,639	748	804	786	855	1,527	749	802	20	19,205	− 854
Barrow Corporation	1,011	960	999	956	966	915	999	835	810	835	26	23,809	− 33
Belfast City Tramways	10,282	10,554	11,088	11,483	11,478	11,962	13,081	12,515	12,474	12,260	26	332,178	+ 30,800
Birkenhead Corporation	2,881	2,984	2,887	2,930	2,886	2,791	2,922	2,869	2,835	2,809	25½	68,848	− 10,943
Birkenhead Motor 'Buses	464	533	452	472	419	724	742	662	645	646	26½	20,151	+ 8,369
Birmingham Corporation	33,828	34,015	34,662	33,892	34,749	28,955	29,416	29,164	29,141	30,397	26	768,809	− 36,531
Birmingham Motor 'Buses	2,081	2,121	2,114	2,026	2,094	1,968	2,151	1,893	1,948	2,026	26	55,978	+ 1,041
Blackburn Corporation	3,119	2,767	3,300	3,209	3,160	2,635	2,769	2,696	3,109	2,796	26½	63,528	− 8,957
Bradford Corporation	12,741	12,556	13,177	12,442	13,313	13,882	14,485	13,495	14,876	14,711	26	358,680	+ 23,673
Burnley Corporation	3,522	3,913	3,775	3,742	3,583	3,666	3,901	3,463	3,658	3,473	...	...	...
Burton-on-Trent Corporation	625	625	661	631	649	660	676	636	660	645	26	16,790	+ 950
Bury Corporation	2,581	3,239	2,761	2,938	2,798	2,718	2,862	2,567	2,783	2,688	26½	66,404	− 5,524
Chatham and District	2,042	1,958	1,980	1,831	1,907	1,975	1,862	1,765	1,754	1,876	39	65,530	− 2,450
Derby Corporation	2,513	2,172	2,211	2,237	2,327	2,399	2,305	2,175	2,224	2,211	26	57,384	− 3,339
Dundee City	3,421	3,302	3,276	3,351	3,297	3,467	3,325	3,281	3,197	3,286	19½	65,545	+ 7,952
East Ham Corporation	2,091	2,095	2,161	2,073	2,275	2,090	2,160	2,176	2,158	2,155	26½	56,066	+ 3,912
Edinburgh Corporation	13,440	13,149	13,319	14,001	14,964	12,585	12,972	11,733	13,269	13,081	20	271,575	− 12,061
Edinburgh Motor 'Buses	882	955	931	1,050	1,121	1,587	3,606	3,104	3,722	3,576	20	81,234	+ 64,816
Glasgow Corporation	46,693	45,833	47,566	46,640	48,615	46,528	47,707	45,809	46,740	48,114	17½	802,383	+ 38,419
Glossop (Urban Elec. Supply Co.)	265	274	300	279	267	234	261	253	267	264	40	9,393	+ 116
Halifax Corporation	5,144	5,016	5,279	4,677	5,102	4,611	4,952	4,818	4,477	4,784	25½	114,712	+ 5,474
Halifax Motor 'Buses	125	116	126	112	120	57	52	54	52	57	25½	2,273	− 620
Halifax Railless Cars	...	...	...	...	...	64	68	63	61	66	10	656	—
Huddersfield Corporation	5,598	5,971	5,606	5,555	5,767	5,123	6,184	5,132	5,201	5,403	27	145,066	+ 13,529
Ilford U.D. Council	1,337	1,331	1,401	1,396	1,450	1,513	1,523	1,487	1,566	1,571	26½	40,822	+ 6,460
Ipswich Corporation	1,100	1,078	1,078	1,031	977	1,065	1,032	935	951	924	26	23,932	− 3,635
Isle of Thanet	2,868	2,757	2,462	1,742	1,392	3,345	3,038	2,650	2 094	1,595	52	64,077	+ 203
Kilmarnock Corporation	380	379	388	374	392	380	379	368	375	379	19½	7,462	+ 26
Leicester Corporation	6,843	6,814	7,211	7,393	7,009	7,213	7,281	7,113	7 584	7,230	—	—	—
Liverpool Corporation	28,748	28,017	28,800	28,161	28,723	30,540	31,578	30,039	30,413	30,602	39½	1,131,485	+ 55,925
London County Council	87,984	89,557	92,140	90,130	97,682	99,257	101,864	100,547	99,535	102,762	26	2,613,772	+ 361,312
Maidstone Corporation	520	540	599	514	636	542	544	562	515	553	25	13,113	− 388
Manchester Corporation	36,042	36,125	36,652	36,882	37,550	38,496	39,757	37,931	39,092	39,682	26	1,040,488	+ 191,202
Newcastle-on-Tyne Corporation	11,232	11,241	11,386	6,731	11,208	11,509	11,641	11,422	11,490	11,752	26	300,501	+ 13,032
Nottingham Corporation	7,904	7,694	7,846	7,694	7,913	7 383	7,536	7 294	7,295	7,520	26	165,057	- 40,004
Oldham Corporation	4,803	5,319	5,096	5,086	4,978	4,424	4,959	4 912	5,011	4,962	27	133,306	+ 2,424
Reading Corporation	1,764	1,739	1,824	1,737	1,787	1,775	1,681	1,696	1,601	1,640	26	42,083	− 2,531
Reading Motor 'Buses	306	319	298	293	291	394	398	359	348	346	26	9,546	+ 2,455
Rotherham Corporation	2,847	2,755	2,858	2,739	2,727	2,541	2,477	2,498	2,340	2,430	25	55,959	− 11,550
St. Helens Corporation	2,478	2,230	2,532	2,322	2,361	1,866	1,880	1,845	1,729	1,697	26	48,047	− 7,332
Sheffield Corporation	20,758	21,785	21,163	21,433	21,336	19,985	20,196	19,362	20,163	20,058	26½	522,297	− 35,326
Southampton Corporation	3,518	3,471	3,501	3,311	3,469	3,461	3,484	3,374	3,281	3,257	26	77,346	− 5,397
Southampton Motor 'Buses	244	228	250	229	248	94	97	99	97	95	26	5,025	- 904
Southend Corporation	3,519	3,236	3,200	2,425	2,353	4,079	3,917	3,511	3,003	2,769	27	74,822	+ 1,379
South Shields Corporation	2,060	2,109	2,025	1,965	...	1,874	1,868	1,760	1,741	...	26	43,028	− 7,057
Sunderland Corporation	3,215	3,206	3,075	2,977	3,080	2,840	3,003	2,660	2,787	2,645	26	70,661	− 13,543
Swindon Corporation	438	418	422	419	413	442	446	422	424	419	25½	10,747	+ 326
Tyneside Tramways and Tramroads	1,554	1,366	1,430	1,278	...	1,131	1,211	1,165	1,127	...	12	14,075	− 2,389
Wallasey Corporation	2,744	2,676	2,643	2,622	2,658	2,929	3,191	2,795	2,815	2,826	26½	76,758	+ 4,846
Wallasey Motor 'Buses	199	168	196	170	166	193	320	176	252	191	26½	6,862	+ 1,720
Walsall Corporation	1,759	1,737	1,824	1,726	1,774	1,665	1,678	1,641	1,594	1,640	27	44,042	− 3,054
Walsall Motor 'Buses	1,247	1,249	1,291	1,219	1,200	983	1,001	957	916	953	27	25,339	− 4,369
Walthamstow U.D. Council	2,070	2,153	2,160	2,066	2,126	2,182	2,221	1,948	1,977	2,030	26½	53,609	+ 2,326
Warrington Corporation	1,009	988	1,019	1,009	1,020	1,010	1,024	1,011	1,002	1,012	26	25,526	− 349
West Ham Corporation	5,510	5,541	5,647	5,601	6,177	5,907	6,005	6,083	5,881	6,092	26	154,461	+ 10,420
Wolverhampton Corporation	2,467	2,498	2,386	2,640	2,479	2,461	2,413	2,373	2,525	2,437	27	63,694	− 3,142
Wolverhampton Motor 'Buses	455	468	462	466	474	671	706	644	662	663	27	17,779	+ 6,417

Underground Electric Railways Company of London, Limited.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	Sept. 4	Sept. 11	Sept. 18	Sept. 25	Oct. 2	Sept. 3	Sept. 10	Sept. 17	Sept. 24	Oct. 1	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Underground Rlys. & L.G.O. Co.	...	...	...	...	...	237.103	245.965	232.084	241.591	245,737	39	9,303.265	—
London and Suburban Traction	...	...	...	...	...	57.936	60.977	54.496	56.533	57.779	39	2,172.938	--

Colonial and Foreign Tramway Traffic Returns.

Companies Issuing Weekly Returns.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	Sept. 4	Sept. 11	Sept. 18	Sept. 25	Oct. 2	Sept. 3	Sept. 10	Sept. 17	Sept. 24	Oct. 1	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	77,069	80,204	79,336	79,277	78,304	79,091	84,811	81,017	81,084	81,899	39	3,100,625	+ 152,242
Calcutta Rs.	99,375	102,891	100,340	90,741	83,567	95,667	59,548	92,180	97,404	100,603	42	3,154,707	− 517,160
Madras Rs.	...	(2 weeks)	55,962	(2 weeks)	50,708	...	(2 weeks)	50,965	(2 weeks)	45,129	36	734,390	− 162,259
Pernambuco	5,991	5,604	5,684	5,521	5 314	3,695	3,671	3,610	3,789	3,868	39½	146,498	− 122,849

Companies issuing Monthly Statements only.

	1920.						1921.						Wks.	AGGREGATE.	
	April	May	June	July	Aug.	Sept.	April	May	June	July	Aug.	Sept.		1921.	+ or −.
	£	£	£	£	£	£	£	£	£	£	£	£		£	£
Ballarat & Bendigo	4,933	3,673	3,672	3,690	3,588	...	5,120	4,570	4,134	3,842	3,809	...	20	21,475	+ 1,919
Brazilian Trac. Mlrs	10245000	10985000	10874000	11745000	11837000	...	13562000	14462000	14257000	15477000	15744000	...	34	111,420.000	+26798000
Brisbane	...	...	...	53.300	46.650	45,430	...	...	...	48.850	50.675	46,220	39	424.040	+ 11.020
British Columbia $	749,081	720,004	710,210	788,402	310,608	...	791,688	774,523	750,907	840,155	844,154	...	9	1,684,309	+ 85,299
Buenos Ayres L'c'z.	53,429	54,563	50,635	51,508	53,952	53,603	60,238	58,492	51,071	51,944	55,673	55,873	13	163,690	+ 4,627
Burma	44,673	46,783	50,471	52,289	48,553	...	50,159	48,353	54,275	43,764	55,168	...	4	55,168	+ 6,615
Cape Town	...	24,395	...	...	...	...	27,662	27,407	25,038	25,571	25,164	...	—	—	—
Carthagena & H.	5,482	5,313	5,562	4,164	3,721	2,273	2,329	1,602	1,410	1,936	1,773	4,244	38	22,236	− 16,528
Cordoba	...	...	...	20,189	21,028	...	...	...	...	23,629	23,851	...	21	116,246	+ 15,463
East India	3,916	3,980	3,862	4,081	4,109	4,228	4,560	4,392	4,078	4,591	4,513	4,154	8	8,667	+ 330
Kalgoorlie	3,246	3,276	3,029	...	...	...	2,398	2,362	2,308	...	...	...	26	12,288	− 5,655
La Plata	6,142	...	...	5,353	...	...	5,878	...	...	5,425	...	...	30	33,317	− 5,180
Manila $	254,103	261,803	267,169	282,260	292,418	...	279,535	293,873	310,559	305,126	297,128	...	34	2,412,419	+ 236 073
Monte Video	...	42,401	39,989	39,647	42,771	41,816	...	46,579	42,960	42,411	44,672	44,927	48	508,426	+ 36,904
Para	24,760	25,831	25,392	24,243	24,571	...	24,340	24,755	24,884	24,655	22,940	...	39	216.894	− 5,785
Port Elizabeth	...	6,165	...	...	...	...	7,082	6,304	6,180	6,515	6,578	...	—	—	—
Rangoon Rs.	117,860	119,000	117,735	118,667	117,836	114,857	125,163	138,950	130,000	133,536	133,000	132,225	39	1,194,301	+ 130,846
Toronto $	1211,708	1206,930	1127,239	1189,315	...	...	1259,933	1271,306	1295,701	1229,483	...	...	31	8,877,669	+ 642,606
Winnipeg $	431,685	404,742	407,625	391,709	368,616	...	462,378	433,836	432,894	390,109	393,823	...	34	3,574,602	+ 169,600

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DEC. 2nd, 1920.	MAY 19th, 1921.	JUNE 24th, 1921.

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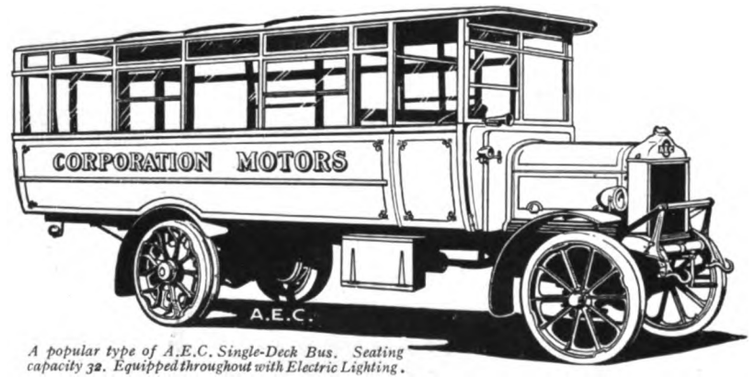

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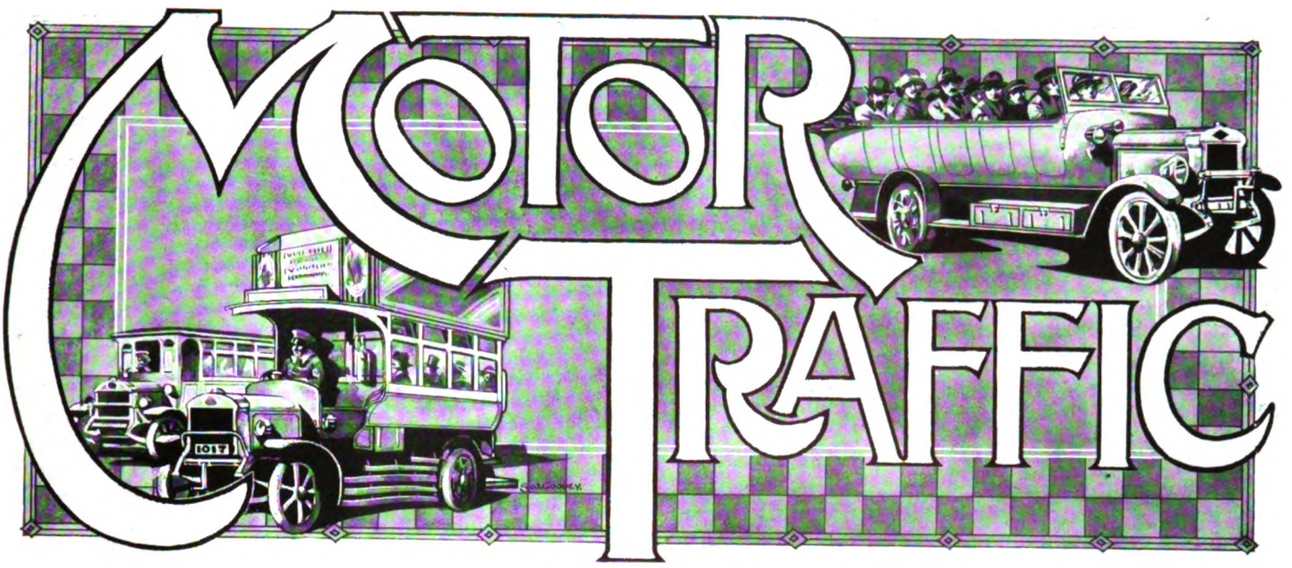

MOTOR VEHICLES IN THE PUBLIC SERVICE.

The exhibition of commercial vehicles, tyres and accessories at Olympia this year is of special interest, on account of the reduced prices which are so apparent in each department of the industry. It has been an open secret for some months past that buyers either could not or would not place their orders for new vehicles while the price lists remained as published at the beginning of the year. In our own particular field it is recognised that public services must go on, but when to high capital cost, high maintenance charges have to be added, curtailment of services or, at the best, keeping them to the minimum, has had to be the universal practice of both municipal and company proprietors. The net result of this has been disastrous to manufacturers, for in many cases when additional vehicles were essential to the service, makeshift purchases have been made with the openly expressed intention of "carrying on" until the price of the new machine came within the purchasing power of those responsible for the running of these services. There can be no question that the need for motor vehicles in the public service field—both material and passenger carrying—is greater than at any time in the past. The high wages of the employees make it essential that municipal services shall be conducted in a manner which assures efficiency at the least expenditure in wages. This can only be done by the use of labour-saving appliances of the most improved type and the rapid handling of all the materials used in every department of the public services. With regard to passenger vehicles, the tendency for years past has been to spread the population over a wider area, while the housing schemes have created a still stronger need for additional means of transport in towns and cities. In most cases the motor omnibus offers an excellent solution of the traffic troubles of the congested areas, either in conjunction with the tramway system, or by giving supplementary service, and thereby forming a relief system. It must, however, be realised that there is a limit to the amount of revenue to be derived from such services, so that not only must the capital cost be considered, but the cost of maintenance must be reduced if full advantage of the possibilities of the motor omnibus is to be realised. For these reasons we heartily welcome the fall in manufacturers' prices, all the more so as we are confident that the high standard of material and workmanship set by the leading firms will be fully maintained. In considering the cost of maintenance, one of the most hopeful indications of improvement is the increased number of miles which certain types of machines are now able to run to the gallon of fuel consumed. Concentration upon this all-important point on the part of engine designers should certainly do much to strengthen the position of the motor vehicle manufacturers when competing for public service orders, as in no other field are closer records taken of the details of running costs, or the advantages in this respect more accurately appreciated.

PROSPECTIVE ACTION OF THE RAILWAYS.

It may be taken as perfectly certain that the railway companies have no intention of leaving the position as regards their powers to run road services where it is to-day. We referred recently to this matter, and indicated the view that the policy of the motor-using interests in getting the railway proposals side-tracked on a point of procedure was of doubtful wisdom. A glance at the daily papers nowadays will serve to show that the views that are being impressed upon the public as to the managing ability of the railways are very different from what they were a few months ago. When, some time next year, the railway companies renew their claims, probably by introducing them in a private Bill affecting only one group in the first instance, they will do so in an atmosphere far more favourable to their success than that in which they have worked for years past. It remains to be seen whether the road carrying interests, through their own associations, which have never co-operated very freely with other motor-using and trade organisations, will be able to exert enough influence to give them much chance of making their opposition effective. The position of the motor manufacturing interest is not identical with that of the motor user, inasmuch as the former would, in the event of the railways succeeding, benefit by considerable orders for heavy transport vehicles, provided that they were successful in ensuring that the railways themselves would not engage in motor manufacture. On this point there is the possibility of agreement between two of the principal parties concerned. If such an agreement were reached, it would very much weaken the standing of the opposition.

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MOTOR TRAFFIC

WHAT SIZE VEHICLE?

The Commercial Vehicle Exhibition at Olympia provided, as usual, an admirable opportunity of studying new models and forming views as to the types most suitable for the particular services for which vehicles are needed. An examination of a number of different models may, however, have led to some confusion in the minds of the prospective purchaser. The choice as between the different makes is not the most difficult part of the selection of a vehicle. There are many makes that are thoroughly reliable and, while individual preference may indicate one as against another, satisfactory performance may be relied upon by dealing with firms which have reputations to maintain. A fairly common error in selection is to allow subsidiary matters to unduly influence judgment. Some particular feature in the design of a body may appear to be desirable, and the vehicle as a whole may be selected on the strength of this one feature which could without difficulty or great expense be incorporated in any machine selected. The most serious errors in selection are, however, principally made in respect of carrying capacity, the vehicle chosen being either too small to be economical or too large to be really suited to the work. The safe principle on which to start is that the larger the unit employed, the better will be the economy, provided that there is work enough to keep the vehicle steadily occupied, and that the work is of a kind that enables the vehicle to be efficiently used. The determining factor in the case of a goods-carrying vehicle is not as a rule the same as in the case of a passenger vehicle. The right capacity of the latter in general depends on the bulk of traffic upon which one may depend. If the bulk of traffic is great, then the running of a frequent service is not incompatible with the use of vehicles of large capacity. If the bulk of traffic is comparatively small and vehicles of large capacity are used, the service must be infrequent. An infrequent service, even if the fares charged are low, does not as a rule attract the public and therefore does not develop as it ought.

In the case of the goods-carrying vehicle, within reasonable limits the right capacity can be gauged rather by the character than by the gross quantity of the load to be dealt with, as in many cases the load takes a long time to put on and to take off. In delivery work in particular, unloading is a very serious item. Consequently if the load consists of small parcels which have to be delivered singly, a vehicle of comparatively small capacity must certainly be selected, perhaps running on pneumatic tyres. Suppose, on the other hand, that the weight of each consignment is considerable, a much larger vehicle may be advantageously employed. It is, in fact, essential in choosing vehicles for delivery work that the trader should know the approximate time it takes to deliver a given weight of average goods.

If the work consists merely of the haulage of material or produce for delivery in one consignment at the end of the journey, the proposition is quite a different one and in all probabilities quite a large vehicle can be chosen. In this case, an important point is to consider whether the load can be roughly handled. If so, something in the nature of a tipping body or some other scheme for rapid unloading is almost certainly indicated.

SHORT PERIOD LICENCES.

During the passage of the Finance Act this year, provision was made to enable the Minister of Transport, without further reference to Parliament, to vary from time to time and within fixed limits the regulations as to the issue of short period licences for motor vehicles. The scheme at present in force is unpopular because no licence can be obtained for a shorter period than three months, and every so-called quarterly licence ceases to be current at the end of each calendar quarter. It follows that if a licence is taken out towards the end of the quarter the payment is the same as for three months' use of a vehicle, in return for which perhaps only two or three weeks' use is actually obtained. Under this arrangement, owners are inclined to postpone the taking out of licences until the beginning of a new quarter. Another objection is that a substantial extra charge is made for the quarterly licences, and four of these licences cost about 20 per cent. more than one annual licence. This discrepancy cannot be justified by the extra clerical cost involved.

The trade dislikes the present system because it tends to make purchasers refrain from taking delivery until the beginning of the quarter. Thus business is inclined to alternate between rush periods and periods of slackness, and it is difficult for the trader to organise efficiently for both. Much discussion as to the best solution of the problem has taken place. One suggestion was that it might be made permissible to take out at any time a licence good until the end of the quarter in return for a payment representing the actual period during which that licence is available. This scheme has the disadvantage that if, for example, a motor coach owner wished to lay up his vehicles for the winter about half way through October, he would either have to take out licences for the whole quarter ending in December or else stop his services earlier than he intended, namely, at the end of September. He would be no worse off than under the existing plan, but one of the objections to the present system would remain. Consequently more general support is given to a proposal that licences should be issued at any date, available for any number of months, part of a month being reckoned as a whole month for purposes of computation. The scheme certainly has the disadvantage that a vehicle carrying a short period licence could not be identified as carrying a current licence without stopping for the licence card to be examined. There is, however, reason to anticipate that the Minister of Transport will be induced to approve the plan which the motoring community would like to substitute for the present arrangement.

COMPULSORY PNEUMATICS.—In view of the heavy costs to local authorities of the maintenance of roads owing to the great and ever increasing traffic, and in order to minimise the wear and tear of the roads, the Mountain Ash U.D. Council have asked local authorities to support a resolution requesting the Ministry of Transport immediately to take such steps as may be necessary to require the proprietors of motor lorries, omnibuses, and chars-a-bancs to provide such vehicles with pneumatic-tyred wheels.

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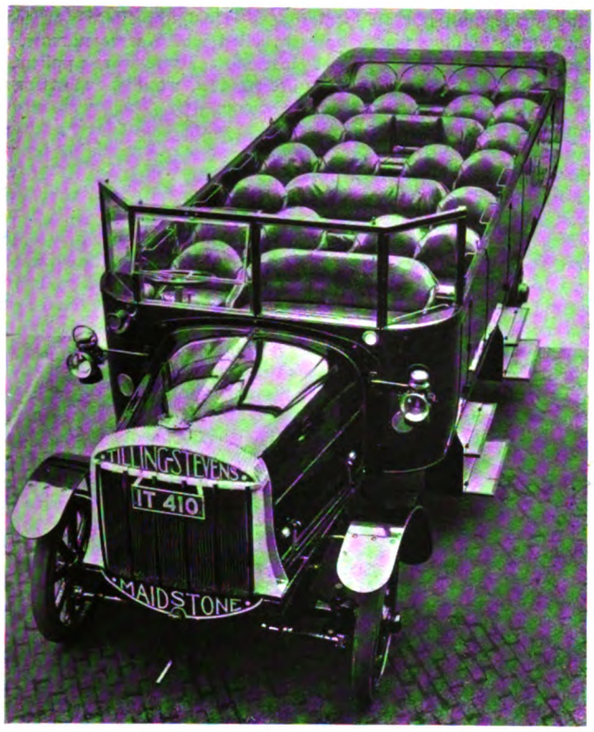
TILLING-PICKFORD COACHES.

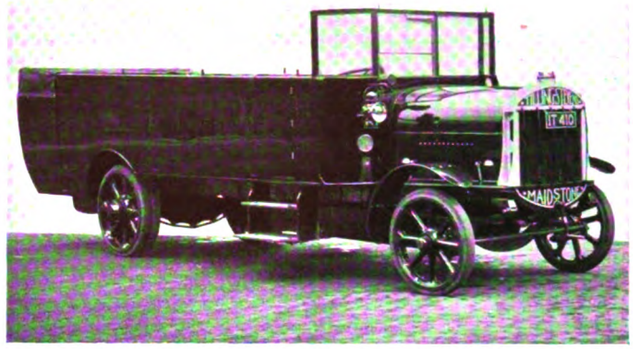
The coach here illustrated is one of a number specially designed for the long distance touring traffic so successfully developed during the past few years by Messrs. Thomas Tilling, in conjunction with Pickford's, Limited. In the early days of this traffic the ideas of progress amongst proprietors seemed to be limited to increasing the carrying capacity of each vehicle to the greatest possible extent, without paying due regard to the comfort of the passengers. On comparatively short journeys the limited space provided for each person was accepted with more or less satisfaction, but the new industry soon discovered that in order to satisfy the rapidly-growing class who were prepared to pay a reasonable sum for increased comfort on long journeys, an entirely different arrangement of the seating accommodation would have to be made. Further, it was found that a number of refinements were also necessary which were not essential in the short journey vehicles. As pioneers in passenger transport, Messrs. Tilling can claim some knowledge of the requirements of that section of the travelling public who prefer the open road. To the experience gained by them has been added that



Front View Showing Seating Arrangement—Tilling-Pickford Coach.

of Messrs. Pickford's, the originators of motor coach tours from London, and as a result there has been evolved the handsome vehicle illustrated on this page.

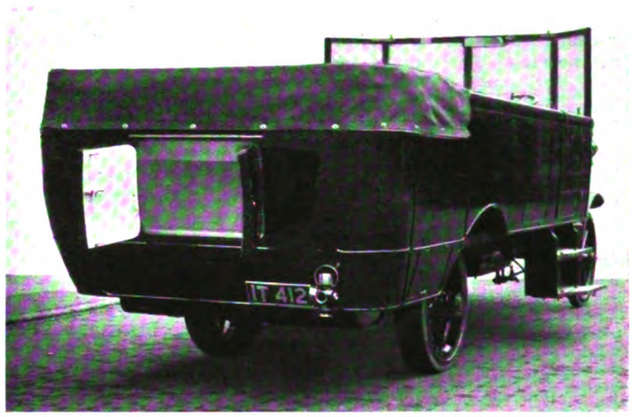
As the tours for which these vehicles were designed extend from seven to twenty-one days, care had to be taken to ensure not only the comfort of the passengers but the certainty of reaching the stopping places in the time arranged. In this connection it is worthy of note that during the season just closed, although over 70,000 miles were traversed, only on two occasions has a breakdown been reported. In one case the vehicle was able to complete the programme after a delay of an hour; in the other the vehicle was replaced in time for the tour to be continued in accordance with schedule time the following morning. This experience affords excellent testimony both as to the perfection of the organisation and to the reliability of the vehicles. The tours arranged for the season included North and South Devon, covering a distance of 560 miles spread over 7 days; Devon and Cornwall, 800 miles in 11 days; North Wales, 560 miles in 8 days; Wales, 750 miles in 11 days; the English Lake District, 800 miles in 14 days; English and Scotch Lakes, a combination tour embracing 1,100 miles by road, 170 by steamer, and 50 by train in 15 days; and a 21 days' trip from London to Inverness and back. The fleet of vehicles working in this service now consists of twelve, made up of nine 4-ton machines carrying 29 passengers (as illustrated), two 2-ton, with accommodation for 22 passengers, and one 1-ton, seating 14. The two larger types are mounted on Tilling-Stevens petrol-electric chassis, and the small one on a Unic chassis. Some idea of the growing popularity of "the ideal way of achieving a perfect holiday" will be gathered from the statement that whereas during the season of 1919 a total of 16,000 miles was covered, this was increased to 43,000 miles in 1920 and to 70,000 during the past season. These figures are



Tilling-Pickford Coach.

exclusive of the daily services which have been maintained to all the popular seaside resorts.

The vehicles have been especially designed for comfort, the seating accommodation comprising lounge armchairs, with ample room to change position. Rugs are provided as well as rails to carry them when not in use. Generally speaking, the construction of the coach can be taken as an excellent example of the coachbuilder's craft, both in regard to the selection of material as well as to workmanship. The design is registered. All the framing and pillars are of prime selected English ash, while the panels are of hand-beaten steel and aluminium. The rear portion is so constructed that it provides adequate luggage accommodation, which is totally enclosed by doors fitting flush with the back panels, as shown in the rear view of the machine. The interior seats are trimmed in antique hide of superior quality. Both the backs and seats are of a patent spring type,



Luggage Compartment of the Rear.

stuffed and padded with horsehair, the cushions being movable. A special feature is that the patent spring-lifting canopy when down folds flush into a recessed part of the body. The neat appearance will be noticed in each of the views given. All interior woodwork is polished and varnished in natural wood colours, while the high-class finish of the exterior adds considerably to the handsome appearance of the vehicle. The whole of the body work was the product of the works of Messrs. Thomas Tilling, under the supervision of Mr. Hodges, manager of the coachbuilding department

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who, in conjunction with Mr. James, of Messrs. Pickford's, was responsible for the details of the design.

The chassis shown in the illustrations is the Tilling-Stevens 4-ton petrol-electric passenger vehicle type, which can be regarded as one of the most suitable for this class of work, combining as it does the smooth running of the electric vehicle with the speed of the petrol car. In view of the forecast of the new regulations governing passenger vehicles which was recently published in this journal, it is worthy of note that the petrol tank in these vehicles has been placed at the rear. It is of extra large capacity, and can carry sufficient spirit for the longest of the day runs. Another point in this connection worth mentioning is the width of the entrance doors. These are of large size, and are so arranged that the full width of the opening is available.

Although the touring season is now past, these excellent coaches are seldom idle, for there is a considerable demand for their use from the film producing industry on account of the great possibilities of the electrical equipment. By removing some of the seats powerful illuminating apparatus and effects can be transported to remote sites, where at any hour of the day or night scenes can be recorded, current for the lighting being taken from the dynamo of the vehicle.

A number of these coaches will be seen running in London during the motor show in November, as Messrs. Pickford's have contracted with the Society of Motor Manufacturers and Traders to operate a constant service between Olympia and the White City for the conveyance of the visitors to and from the two sections of the exhibition.

As to the possibilities of motor coaches competing with railways, Mr. James, who has charge of the passenger carrying department of Messrs. Pickford's, is of opinion that competition in the ordinary acceptance of the term is out of the question entirely. Each system, he says, caters for an entirely different class of traffic. The travellers who wish to spend their time at one place will use the railways, and those who find pleasure in viewing varied scenery in the open air at a comparatively low speed will use the king's highway. With the development of the continental tours, which have been so well patronised during the past season that Messrs. Pickford's contemplate wide extensions for next year, the coach tours will bring traffic to the railways, and in combination will encourage the spirit of travel which is now becoming so pronounced.

SIR R. DENNIS'S WORLD TOUR.

The Outlook for British Vehicles.

Sir Raymond Dennis, managing director of Messrs. Dennis Brothers, Limited, of Guildford, recently returned to this country at the close of a tour extending over 20 months. During that period he travelled 60,000 miles and visited India, Ceylon, Burma, Malay States, Dutch East Indies, China, Japan, Australia, New Zealand, Peru, Chili, the Argentine and Brazil.

Writing to the *Evening Standard*, of September 30, Sir Raymond said—"The possibilities of overseas trade in commercial vehicles are exaggerated. It may be taken generally that the weakness of bridges and/or the poor quality of the roads compels the authorities to limit the maximum weight of mechanically-propelled vehicles, which is so low in some countries as almost to exclude British-made lorries, certainly the type of lorry which, by reason of the experience gained over the shell-pitted roads of France and Flanders, is best adapted to the terrible road conditions which obtain in so many countries, both British and foreign, overseas.

"Surely the present condition of trade has proved the fallacy of the policy that restriction of output means more work for more hands. It is a policy that raises costs till they reach a level that drives orders elsewhere. Increased output can so reduce cost as to ensure prices that will secure the world's orders that now pass us, and in this way only can the problem of unemployment be solved."

Sir Raymond has since announced that, as the result of his tour, the Dennis Company have decided to sell their standard lorry at £850, £300 less than the topmost war price, and only £100 more than in July, 1914. Other vehicles will also be reduced.

This step means, he says, writing down the value of stocks by two or three hundred thousand pounds, but it also means re-employment and new trade.

COST OF THE ROADS.

Sir H. Maybury and Tramway Liability.

A conference of the West of England Division of the Commerical Motor Users' Association was held at Bristol on October 5 under the presidency of Mr. W. G. Vernon Smith.

Sir Henry Maybury, director-general of the Roads Department, Ministry of Transport, said he appreciated the difficulties of motor users, and was sure they would appreciate his. It was said that the taxes on the industry bore very heavily. When they remembered that prior to 1914 the cost of maintaining the roads was 18 millions a year, and was now upwards of 50 millions, they would see that had it not been for the taxation complained of they might have been in a very much worse position. The Ministry's scheme was working very well. Motor users had put an intense burden on the roads of the country. There were some 850,000 mechanically-propelled vehicles licensed in Great Britain. Practically nothing was done on the roads from 1914 until after the armistice. It was not generally known that the Government found ten millions from the Exchequer in 1918. That was substantial help. The Ministry had classified 35,000 miles of roads on which alone the money was being spent, and not on local roads. He knew there were roads over which holiday traffic now travelled which were narrow, tortuous, and weak that were not classified. There were applications to have them closed, but if they did so, they would be shutting out some of the great beauty spots of the country. There was only one thing which stopped him classifying the roads, and that was money. Almost every penny paid in taxation was made available for road improvement. He was against the closing of roads if it were possible to prevent it. If they had to do so he hoped they would have a standard sign to indicate that they were closed. With regard to the question of the speed, especially of the heavier vehicles, there was no power vested in the Ministry to enable the law to be set aside. Certain recommendations had been made, but it would be for Parliament to decide the matter. He held in his hand a copy of a resolution passed by Gloucestershire County Council stating that the licence duties on heavy motor vehicles were not proportionate to the damage caused to the roads, and urging the Government to increase them. Similar resolutions were reaching the Ministry from all parts of the country. He did not think that such resolutions were justified. They had hardly had a year's experience of the taxation scheme, and should wait and see how it worked out. He thought they were at the top of the wave as regards expenditure and cost of material, and he hoped that the receipts from the new scheme would increase, and lessen the burden on local authorities.

The Burden on Tramways.

Another matter which must soon engage the attention of the Ministry of Transport was that of the tramways of the country and the burden now upon them for road maintenance and repair. In 1870, when the Tramways Act was passed, there was little motor traffic. That had largely increased, and there was therefore now something to be said for the tramways. The tramway companies, however, had accepted the obligation put upon them, and they ought to go to Parliament for relief. The tramways occupied the best position on the highway, and if they were relieved of the maintenance and repair of the road they must pay for the use of the road. They could not expect to pay only hackney carriage licences, but would have to be taxed according to the carrying capacity of the vehicles. In addition to the classification scheme the Ministry were engaged in many centres constructing new roads.

Mr. Vernon Smith, in proposing a vote of thanks to the speaker, said the tramways had a great hardship in having to pay for the upkeep of the roads for other people who used motor-propelled vehicles.

The Nottingham Tramways Committee have considered a suggestion by the Watch Committee that omnibus services in different parts of the city should be provided without delay. The committee have come to the conclusion that the Council should adopt the policy of providing omnibuses for such districts within the city as and where it is deemed such services become necessary or remunerative. In pursuance of this policy the committee have authorised a further experimental service for the Whitemoor and Bagnall Road district as soon as the vehicles can be obtained. With regard to omnibuses outside the city, the committee are of opinion that the time is not opportune for establishing services, having regard to the present economic conditions.

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THE LAFFLY SALOON OMNIBUS.

GRATIFYING RESULTS OF TRIAL TOUR.

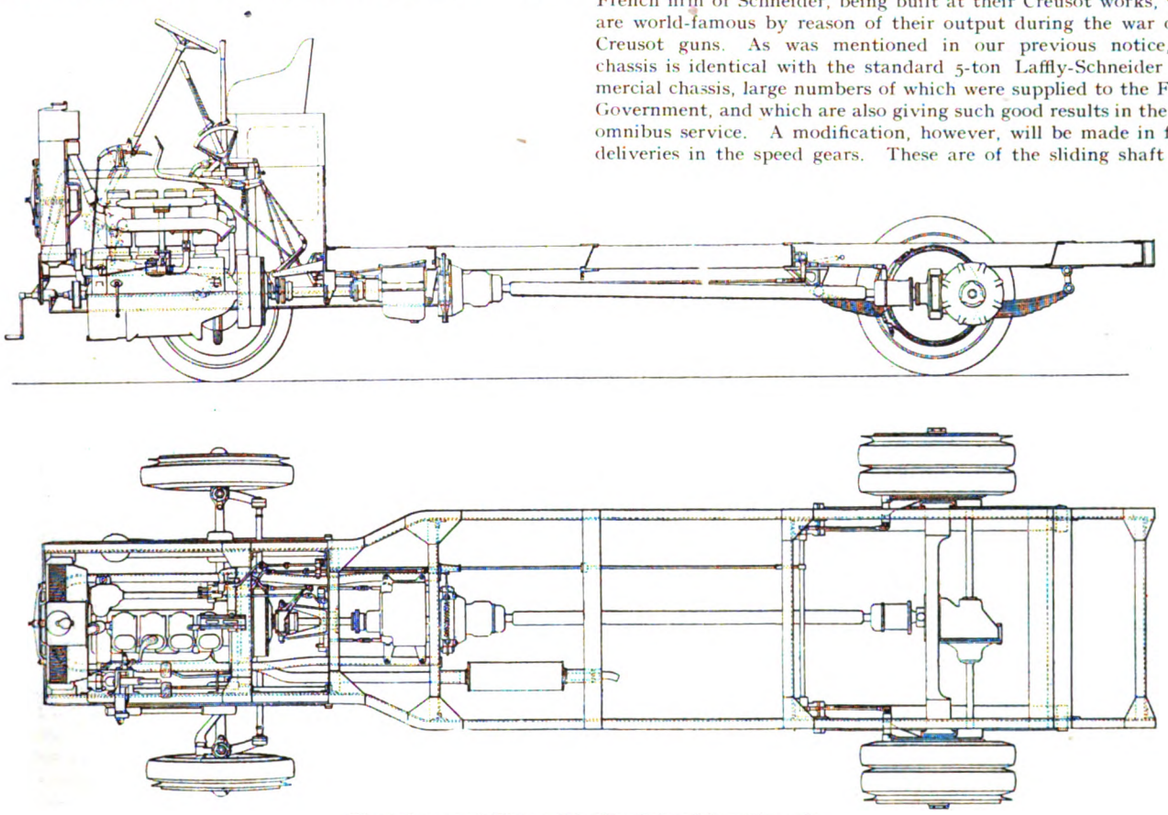
The 1,400 mile tour of the Laffly-Schneider saloon omnibus, arranged by the Laffly (England) Company, was completed in fourteen days in accordance with the schedule previously arranged, and in every respect it can be regarded as an unqualified success. The value of the demonstration clearly lies in the fact that, given a suitable vehicle, it is now possible to make extended tours spread over many days without undue fatigue on the part of the driver or his passengers. A considerable proportion of the company which left the Hotel Victoria at the commencement of the tour completed the round trip, and when discussing the tour each agreed that they experienced far less fatigue than upon any previous tour, although several of them were veterans in motor touring under all possible conditions.

Our correspondent's personal experience was limited to the last two days of the tour, but as the route traversed from Brighton, *via* Lewes and Hastings to Folkestone, and thence to Maidstone and London, covered some of the worst roads with regard to gradient, width, and surface, he is able to testify to the comfort of the vehicle and the remarkable ease with which it negotiated the most severe inclines. With regard to the former point, the factors which ensured this are three in number. The first is the luxurious upholstery (described in some detail in a previous issue). Other factors are excellent springing of the chassis and giant Michelin pneumatic tyres. It was not intended to establish anything in the nature of speed trials, but as the average for the whole tour worked out at a little over 16 miles per hour, taking in some of the worst gradients to be found in Great Britain, including Fintry Hill and Kirkstone Pass, it is obvious that some excellent running was maintained. The total load, including the passengers and their luggage, was approximately 7 tons, and the average consumption of fuel—a mixture of petrol and benzol—worked out at the remarkably low figure of 11·8 miles to the gallon, while the consumption of lubricating oil averaged half-pint per 100 miles.

The tyres were the Michelin cord type, single on the front wheels and twin on the rear—all 955 × 155—standing 7 inches from the rims. To each of these a "warning gun" attachment had been fitted, which in practice gives a loud report when a tyre is punctured, and so permits the driver to stop the vehicle before the tyre is sufficiently deflated to affect the steering. A demonstration of the efficiency of this attachment was given when a front tyre was punctured on the journey to Edinburgh.

The appearance of the vehicle is distinctly novel, this being due to the fact that the driver is positioned immediately over the engine, while the Solex radiator, which is common to all Schneider machines, further adds to this. A noteworthy point in connection with the Solex radiator may here be mentioned. After climbing Kirkstone Pass the condition of the engine was examined, when it was found possible to insert the bare hand in the cooling water after removing the radiator cap—very definite proof of the efficiency of the cooling system.

From the plan and elevation of the chassis the general arrangement of the detail can be clearly seen. It emanates from the well-known French firm of Schneider, being built at their Creusot works, which are world-famous by reason of their output during the war of the Creusot guns. As was mentioned in our previous notice, this chassis is identical with the standard 5-ton Laffly-Schneider commercial chassis, large numbers of which were supplied to the French Government, and which are also giving such good results in the Paris omnibus service. A modification, however, will be made in future deliveries in the speed gears. These are of the sliding shaft type, with gears always in mesh with direct driven top. In the standard model three speeds only have been provided; in subsequent deliveries to this country four speeds forward will be given. One of the outstanding features of this chassis is the long body space available with such a comparatively short wheel base, the former being 19 feet 8 inches and the latter 12 feet 7 inches. Considerable attention was paid to the saloon omnibus on its arrival in the various towns by public service vehicle authorities, both Corporation and company officials showing more or less keen interest in its design and appointments. In one town a definite offer, we understand, was made for the purchase of the vehicle as it stood. The "arrow" direction indicator with which it was fitted was found to be of great service in congested districts, particularly at night when the arrows were illuminated.



Elevation and Plan of Laffly-Schneider Chassis.

To what extent there will be a demand for so luxurious a motor coach as the one here referred to remains to be seen, for it is certainly aptly described as the "road Pullman." The fact, however, that its chassis has come through the strenuous trial with so much credit to its designers should ensure a demand for its type, even if fitted to more modest body-work.

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MOTOR TRAFFIC

COMMERCIAL VEHICLE SHOW.

NOTEWORTHY FEATURES AT OLYMPIA.

The fifth of the series of motor exhibitions devoted exclusively to commercial vehicles was opened at Olympia on Friday, October 14th, being the second since 1913. Although the number of exhibitors is fewer than last year, the evidence of keen interest in the progress of the industry was apparent in every department. With few exceptions chassis manufacturers have been content to confine their efforts to improvement of detail rather than to experiment in new designs. Thus, speaking generally, the majority of the exhibits were familiar types, the reputations of which are known and appreciated. These included petrol, petrol-electric, and steam chassis, and were worthy of, and no doubt received, the closest examination by the discriminating purchaser.

The popularity of the motor coach during the past season, however, has had its influence with the body builder, for in this section considerable progress has been made, both in design and fitting; indeed, it is not too much to say that many of the handsome vehicles on view could be classed as of the luxury order. The wide variety of the types, both in regard to seating capacity and degree of comfort for the passenger, gives the clearest possible evidence that in the opinion of the coachbuilders the development of passenger carrying road vehicles is a safe venture, and one that he is prepared to support to the utmost of his ability. The all-weather types of coaches, as well as the omnibuses, deservedly claimed constant attention, for it was apparent that in their design and equipment great care and thought had been expended in order to produce practical solutions for the many difficulties experienced by proprietors owing to the changing conditions under which public services have to be maintained. A notable example in this direction was furnished by a 36-seat vehicle which can be used either as an open coach or closed omnibus at will. The change in either direction is made by the driver and conductor in less than ten minutes. Several expensively fitted omnibuses attracted considerable attention, while on the utility side good serviceable vehicles with large seating capacity and ample standing room made a strong appeal to those faced with the problem of carrying the greatest number of passengers at the lowest possible cost.

Many valuable accessories, as well as a number of novelties, were staged in the galleries, as well as examples of the standard makes of solid tyres. Giant pneumatics were also in evidence, both on the makers' stands and also on vehicles in various parts of the hall.

In the next issue of THE TRAMWAY AND RAILWAY WORLD there will be an illustrated description of the principal exhibits; on the meantime we append a list of the exhibitors whose stands were of special interest to our readers—

CHASSIS AND BODY SECTION.

Associated Equipment Co. Ltd.
Albion Motor Car Co. Ltd.
Bristol Tramways and Carriage Co. Ltd.
H. G. Burford & Co. Ltd.
Clarkson Steam Motors.
Clayton Wagons, Ltd.
Commercial Cars, Ltd.
Daimler Co. Ltd.
Dennis Bros. Ltd.
Fodens, Ltd.
Guy Motors, Ltd.
De Dion Bouton, Ltd.
Halley's Industrial Motors, Ltd.
J. & E. Hall, Ltd.
Karrier Motors, Ltd.
Leyland Motors, Ltd.
Maudslay Motor Co. Ltd.
McCurd Lorry Co. Ltd.
Walker Bros. (Wigan), Ltd.
Scammell & Nephew, Ltd.
Star Engineering Co. Ltd.
Straker-Squire, Ltd.
John I. Thornycroft & Co. Ltd.
Tilling-Stevens Motors, Ltd.
Vulcan Motor & Eng. Co. Ltd.
Richmond Motor Lorries, Ltd.
Yorkshire Commercial Motor Co. Ltd.
Jas. Booth & Co.
Christopher Dodson, Ltd.
Eagle Engineering Co. Ltd.
E. & H. Horn, Ltd.
Liversedge & Sons, Ltd.
Caledon Motors, Ltd.
R. Garrett & Sons, Ltd.
General Vehicle Co.
Laffly (England) Co.
Ransomes, Sims & Jefferies. Ltd.
Sentinel Wagon Works, Ltd.
W. & G. Du Cros, Ltd.
Carrisserie Latymer, Ltd.
Strachan & Brown.

TYRE AND ACCESSORIES SECTION.

Allen-Liversedge, Ltd.
Arrota Electrical and Motor Accessories Co. Ltd.
Avon India Rubber Co. Ltd.
W. & A. Bates, Ltd.
Bergongnan Tyre Co.
British Thomson-Houston Co. Ltd.
British Timken, Ltd.
Carbic, Ltd.
Robert W. Coan.
J. W. & T. Connolly, Ltd.
The Coventry Chain Co. Ltd.
G. Davenport & Co. Ltd.
Drummond Bros.
Dunlop Rubber Co.
Ferrodo, Ltd.
The Glacier Metal Co. Ltd.
B. F. Goodrich Co. Ltd.
The Goodyer Tyre and Rubber Co. Ltd.
Hays, Standen & Co. Ltd.
Henley's Tyre and Rubber Co. Ltd.
The Hoyt Metal Co. Ltd.
E. Kalker & Co.
Chas. Macintosh & Co. Ltd.
Michelin Tyre Co.
The Midland Rubber Co. Ltd.
Henry Miller & Co. Ltd.
North British Rubber Co.
J. & R. Oldfield, Ltd.
Phosphor-Bronze Co. Ltd.
Pirelli, Ltd.
Ransome & Marks Bearing Co. Ltd.
Shrewsbury S.T. and Challiner Tyre Co.
Simplex Rubber Co.
Skefko Ball Bearings Co.
St. Helens Cable and Rubber Co. Ltd.
Stern's, Ltd.
Leo Swain & Co.
United States Rubber Co. Ltd.
The Vacuum Oil Co. Ltd.
C. A. Vandervelt & Co. Ltd.
C. C. Wakefield & Co. Ltd.
Wood-Milne, Limited.
The Zenith Carburetter Co. Ltd.

INAUGURAL LUNCHEON.

QUESTION OF MOTOR VEHICLE TAXATION.

An inaugural luncheon marked the opening of the exhibition on Friday, October 14. Mr. A. S. Mays-Smith, president of the Society of Motor Manufacturers and Traders, occupied the chair, and among those present were—

Mr. A. Neal (Parliamentary Secretary to the Ministry of Transport), Mr. F. Churchill (chairman of the Commercial Motor Vehicle Section of the society), Lord Montagu of Beaulieu, Sir W. Joynson-Hicks, Major Percy C. Simmons (chairman of the London County Council), Major-General Sir E. E. Carter, Sir W. H. Clark, Sir W. H. Mercer, Sir H. Fowler, Sir G. H. Ashdown, Mr. J. D. Kiley, Lieut.-Col. W. P. Robinson, Capt. H. Riall Sankey, Major Stenson Cooke, Mr. L. B. Atkinson, Mr. W. W. Beaumont, Mr. H. E. Blain, and Col. R. E. Crompton.

Mr. Neal proposed the toast of "The Commercial Motor Vehicle Industry." He said the Minister of Transport was keenly desirous that the roads of the country should be made suitable in every respect for modern requirements, and the Roads Department was working whole-heartedly in that direction.

Mr. F. Churchill responded, and said the taxation revenue derived from commercial motor vehicles was greater than that derived from private motor cars. It was high time some voice was raised against the excessive cost of roadmaking and maintenance. This seemed to be largely due to the direct employment of labour by local authorities. They seemed to have practically no control over the labour they employed.

He understood that the cost of road works was so high that, whatever amount was realised from licences, the Ministry of Transport would wish it more. But as the schedule of taxation was designed to produce a revenue of £7,000,000, and licences in 1921 had already yielded nearly £10,000,000, he thought the Minister of Transport might recommend a reduction in the charge for licences. A reduction of 25 per cent. would be very helpful to the industry and still produce more than £7,000,000. If a general reduction could not be made, a reduction should at least be made on fees for motor vehicles used for the transport of goods. The whole industry was strongly opposed to the present system of licences, which seemed to have been framed mainly for the entertainment of the police and to necessitate the maintenance of a host of officials. The fact that licences were issued only as from quarterly dates was irritating. The poor man's motor car—the motor coach—often ran from about mid June to early in September, but the owner had to pay tax as if the vehicle was used for six months. There was an insistent demand for short period licences.

The industry had suffered from the state of the exchanges and the foolishness of labour in limiting output. Economic considerations had so operated that motor vehicles could be bought to-day in this country for less than the cost of production. Prices, however, were not likely to fall any lower. He protested against the unfairness of taxing only self-propelled vehicles. It was a ridiculous anomaly that 15,200 tramway cars paid only as much as 130 motor omnibuses.

The Chairman said Mr. Neal had informed him that one point at least had received the serious consideration of the Government. There would be practically an immediate introduction of broken period licences, and this would come into operation on January 1.

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INSTITUTE OF TRANSPORT.

LORD ASHFIELD ON FUTURE DEVELOPMENTS.

The second annual dinner of the Institute of Transport was held at the Hotel Cecil, London, on Monday, October 10. Lord Ashfield of Southwell (president of the Institute and chairman of the London Underground group of companies) occupied the chair, and the gathering, which numbered about 240, included distinguished representatives of practically all forms of transport. The Chairman was supported by Sir Henry P. Maybury, K.C.M.G., C.B. (president-elect), Hon. Sir Arthur Stanley, G.B.E., C.B., Sir Joseph G. Broodbank, Sir Henry W. Thornton, K.B.E., Sir Henry White-Smith, C.B.E., Sir James Devonshire, K.B.E., Sir Charles Bright, F.R.S.E., Sir R. B. Chadwick, M.P., H. E. Blain, C.B.E. (hon. secretary). H. H. Gordon, L.C.C., Sidney Preston, C.I.E., C.B.E., E. S. Shrapnell-Smith, C.B.E., F. Tatlow, C.B.E., P. Burtt, E. C. Cox., C.B.E., H. P. Currie, A. Dryland, A. L. C. Fell, C.B.E., C. J. Selway, C.B.E., and W. Wolsey. The guests included Mr. Arthur Neal, M.P, (Parliamentary Secretary, Ministry of Transport), Mr. E. Honoratus Lloyd, K.C., Major-Gen. Sir F. H. Sykes, G. B. E., K.C.B., C.M.G., the Lord Mayor of Manchester (Alderman Kay), Capt. H. Riall Sankey, C.B., C.B.E. (president, Institution of Mechanical Engineers), Mr. J. S. Highfield (president, Institution of Electrical Engineers), Mr. S. W. Gladwell (president, Chartered Institute of Secretaries), Mr. Llewellyn B. Atkinson (past-president, Institution of Electrical Engineers), Sir W. Marwood, K.C.B., Sir A. Balfour, Sir George Paish, and Col. W. R. Stratton, C.I.E.

Mr. Arthur Neal, M.P., in proposing the toast of "The Institute," said it was only recently we had awakened to the supreme importance of transport. Without efficient and economic transport the recovery of our commercial position became almost, if not entirely, impossible. The object of those who founded the institute was to raise the status of those engaged in transport from a mere trade to that of a profession, and he looked forward to the Institute obtaining a Royal Charter, so that its diplomas might carry with them the added weight which such a charter would give. In coupling with the toast the name of the Institute's "distinguished President," Mr. Neal said Lord Ashfield had applied himself with characteristic energy and foresight to the improvement of the great transport problems of London, and they wished him every success.

Lord Ashfield, replying, said the Institute had made great strides since its birth in 1919, and referred particularly to the hard work done by the Hon. Secretary (Mr. Blain). Lord Ashfield mentioned that through the good offices of Sir James Devonshire, arrangements had been made with the Institution of Electrical Engineers by which the Institute of Transport would be allowed to use part of their premises as headquarters, and also to make use of their lecture rooms. Transport as an industry, he proceeded, differed from almost any other industry in that service must be rendered whether there was a fair return or not. Indeed, when conditions were least favourable, that was probably the time when transport had to make it greatest effort. In 1913 the gross receipts of the railways in Great Britain were roughly £135,000,000, and for the twelve months ended July this year the gross receipts were round £254,000,000, an increase of £119,000,000. He believed that for this year the total operating cost of our railways would be, roundly, £240,000,000, and he thought he was well within the estimate in saying that the gross receipts would not be sufficient to pay their working expenses, and this made no provision for a return on the £1,300,000,000 invested in railways. Relief would probably be obtained by various methods, including grouping and the electrification of lines, but whether these steps would be sufficient to bring an adequate degree of prosperity to the railways only the future could tell. Meanwhile, mechanical transport would make colossal strides. New roads would have to be built for the great army of motor vehicles yet to be constructed. If we were to do as well as America our motor vehicles must increase from 870,000 to 3,500,000. Our roads to-day were, in many instances, quite inadequate to meet this traffic and must be widened.

Urging the necessity for close co-operation between railway companies and road transport undertakings, Lord Ashfield said one could not separate the railways from the roads; the problem was a joint one. He foresaw the day when the construction of the roads would not be unlike that of the railways, and when, instead of running singly, motor vehicles would operate in trains. More underground railways would have to be made, and he suggested that at the same time they should consider the construction of underground roads, parallel to the railways, for motor traffic.

Mr. E. H. Lloyd, K.C., proposed the toast of "The Transport Industry," and in alluding to the development of various forms of transport, pointed to the remarkable growth of the tramway industry since the first line was constructed in 1860 at Birkenhead by Mr. Train, without statutory sanction, but with the goodwill of the local authority.

Sir Henry Thornton, K.B.E., responded.

Sir H. P. Maybury briefly proposed "Kindred Institutions," and Capt. H. Riall Sankey, in reply, urged the desirability of an association of the various engineering societies for improving legislation in respect of matters affecting them in common. This would also help successive governments and municipalities to put real engineers into engineering jobs, which at present was not always the case.

Mr. J. S. Highfield, Mr. E. S. Shrapnell-Smith and Major Gen. Sir F. H. Sykes, also spoke.

BIG REDUCTION IN DENNIS PRICES.—In view of the stagnation in the export motor trade, the opinion of Sir R. Dennis, managing director of Dennis Brothers, Limited, of Guildford, after his world tour, is of importance. Everywhere he found depression in trade, with no prospect of improvement while present high prices are maintained. The desire for British goods and the recognition of their superiority was very keen, but the present excessive cost, which, in his opinion, is mainly due to certain aspects of trades union policy and to continuous Labour unrest, has rendered foreign trade impossible. As a result of the experience gained by this tour, the Dennis Company have made a big cut in prices of all their standard types. Thus the 4-ton long wheel base omnibus chassis is reduced from £1,300 to £950, and the 4-ton lorry chassis to £850 from £1,180, similar reductions being made on each of their other types. This step will necessitate the writing down of the value of stock to a very considerable extent, but it will stimulate trade, and also give employment to workmen.

LONDON OMNIBUSMEN'S WAGES.—The adjourned conference between representatives of the London General Omnibus Company and the National Transport Workers' Federation concerning the proposal (announced in our last issue) to reduce the wages of the operating staff by 3s. a week was resumed on Wednesday, Oct. 5. The company were represented by Mr. G. J. Shave (chief engineer and operating manager), and the Transport Workers' Federation by Mr. Robert Williams (general secretary), Mr. Ben Smith, Mr. Stanley Hirst, and Mr. Plimston. After about two hours' discussion in private, an agreed statement was made that the company had agreed to withdraw temporarily the 3s. reduction notice in a genuine endeavour to prevent any prejudice to the negotiations which were taking place *re* the proposed extended "spreadover." Various clauses of the new agreement were discussed, and the meeting was adjourned. It was anticipated that an amicable settlement would be arrived at.

MOTOR PATROLS DISCONTINUED.—After five months' trial of police use of motor cycle side-cars for the control of traffic, the London Commissioner of Police has discontinued the experiment. Five such cars, each seating two constables, were used on main roads leading to the suburbs and from East to West, but it has been found that the work could be performed with greater efficiency and less expense by the police on foot. No doubt the men were handicapped by the unsuitability of their conveyances. Moreover, the spectacle of a constable reclining in a side-car was not a dignified one. It is not unlikely that the work would be better performed on a solo machine.

KARRIER PATENT SWEEPER AND LORRIES.—A Karrier patent sweeper has been purchased by the City of Westminster. It is expected that a saving will be effected on the present system of street cleaning sufficient to pay for the initial cost of the vehicle in less than two years. A large order for Karrier lorries has been placed by the Co-operative Wholesale Society, and the City of York are obtaining a 5-ton three-way tipping wagon. Karrier Motors, Limited, took over their new offices at 70, Victoria Street, S.W.1. early in October.

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MOTOR TRAFFIC

ABERDEEN OMNIBUS SERVICE.

Mr. William Forbes, general manager of Aberdeen Corporation Tramways, has issued his annual report on the working of the Council's tramways and omnibuses during the year ended May last. Referring to the omnibus services, he says—

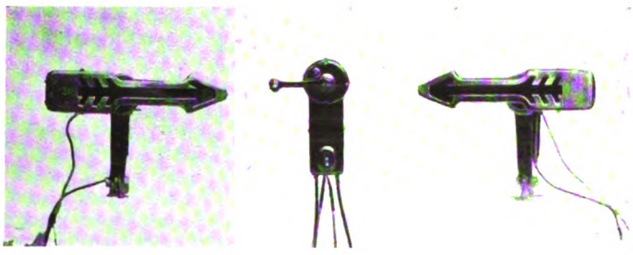
"The policy of introducing omnibuses to supplement the tramway services and to provide for future extensions has now been put into practical effect. On July 19 the first omnibus was delivered, and was utilised for circular tours round the city. It proved so popular that this service is now being continued by means of motor coaches. The first omnibus route was inaugurated on January 10 between Footdee and Castle Street. Subsequently this service was extended to Market Street. On April 30 a service was commenced between the Rubislaw tramway terminus and Hazlehead. When the tramway services were curtailed in connection with the coal dispute, all the available omnibuses and motor coaches were put in service on the different tramway routes with great convenience to the public."

Altogether the revenue from the omnibuses amounted to £3,842, and the working expenses to £2,964. From the gross profit of £878 the sum of £116 has been deducted for interest charges, leaving a net profit of £762. The passengers carried numbered 559,837, and the mileage covered 42,457, the total receipts amounting to 21·72d. per omnibus mile.

THE "ARROW" SIGNALLING DEVICE.

A signalling device in the form of an arrow indicating the direction in which a vehicle intends to travel is finding increasing favour with motor vehicle proprietors by reason of the element of safety which it ensures to vehicles so fitted. The device, which is manufactured by the Arrota Electric and Motor Accessories Company, Limited, of South Lincolnshire, is suitable for all types of motor vehicles and tramcars. It consists of three main parts—an arrow fitted to the front and rear of the vehicle, and a small control box which can be placed in any accessible position close to the driver's hand.

As will be seen in our illustration, the arrow indicators and the control is of neat design and of simple construction. The arrow standard is mounted upon a small bracket, which enables it to be carried on any shaped surface, the bracket being secured in the desired position by screws. The operation of the signal is effected by the turning of the handle of the control in the direction the driver desires to travel. Four signals are arranged for, viz., straight ahead (inverted), turning to the left, turning to the right, and stopping (upright). The arrows are positively locked in any of their positions, and as there is a connection provided for an electric horn, this is sounded automatically whenever the position of the



The "Arrow" Signalling Device.

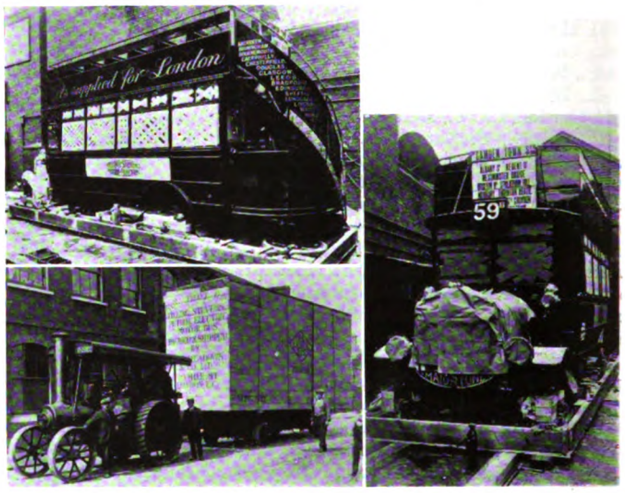
arrow is changed. For night work the arrows are illuminated, the front arrow showing green and the rear one red, the switch controlling the lamps being carried in the control box as well as an independent control for the horn.

Demonstrations can be arranged on application to the Arrota Electrical Company, who make a point of the fact that the insurance companies allow 10 per cent. discount off their rates when cars are fitted with this safety device.

SOUTHEND CORPORATION has found that a hired motor at four guineas a week has effected economy in transport, and the Pier Committee have obtained prices for a light motor van.

OMNIBUS SHIPPED TO CANADA.

Without any dismantling except for the road wheels, a double-deck Tilling-Stevens petrol-electric omnibus has been transported from the works at Maidstone and across the Atlantic to the Toronto Exhibition. Canadians thus have an opportunity of inspecting the latest type of vehicle used for London traffic over routes extending thirty miles from Westminster, the body being arranged for seating as many as 48 passengers on the two decks. The interior



An Omnibus being Shipped to Canada.

has both cross and longitudinal seats, the two latter seating six persons just inside the entrance. There is a roomy gangway in the interior, and the same concession to comfort is apparent in the cross seats on the roof, while the staircase gives greater safety than was the case on the old style of omnibus. Three photographs on this page illustrate the packing and shipment as arranged for Tilling-Stevens Motors, Limited, by Messrs. T. Meadows and Company, Limited.

TRAMWAYS AND LIGHT RAILWAYS ASSOCIATION.

The Journal of this Association for October contains a paper on "Tramcar Wheels and their Relation to the Track," which was read at a meeting of the Auckland branch of the New Zealand Society of Civil Engineers by Mr. F. D. de Guerrier; a reprint of the report of the Ministry of Transport on the accident on the Tynemouth and District Light Railway on July 31 last; and a memorandum regarding details of construction of new lines and equipment issued by the Ministry of Transport. The regulations are the result of consultation between the Ministry of Transport on the one hand and the Municipal Tramways Association and the Tramways and Light Railways Association on the other.

ORDERS FOR KARRIER CHASSIS.—Since the announcement of the price reduction in Karrier motor chassis, an extraordinary number of orders have been received at the Huddersfield works. It is interesting to note that many of these have come from Ireland, where trading conditions seem to have improved since the alteration in the political situation. Owing to the conditions which obtained during the past year or so, there is a big shortage of transport to make good, and advice received from the Motor Hirage and Sales Company, of Dublin, who hold the Karrier agency for Ireland, indicates that business generally is taking a decided turn for the better. Among the local authorities who have recently taken delivery of Karrier street scrapers are those of Manchester and Rotterdam. A large order for Karrier lorries received from the L. & S.W. Railway Company has been completed.

MOTOR OMNIBUSES FOR MANCHESTER.—Manchester Corporation Tramways Committee has ordered two motor omnibuses of the double-deck type, each to carry about fifty passengers. A trial of these vehicles will be made on suburban routes beyond the outward termini of the electric tramways.

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MOTOR TRAFFIC

OMNIBUS SERVICES.

BOLTON.—The Tramways Committee have witnessed a test of the capabilities of an omnibus supplied by Messrs. Guy, Limited.

DONCASTER.—The Tramways Committee propose to connect the Woodlands and Bentley tramway termini by an omnibus service.

ST. HELENS.—The Corporation propose to establish an omnibus service to Billinge and are negotiating with the urban council on the subject.

ABERGELE.—A company has been formed for the purpose of operating omnibuses between Abergele and Llanrwst, via Llanfair and Llangernyw.

SWINDON.—The Town Council have granted licences for an omnibus service to Oxford, Lechdale, Faringdon, and Cirencester, and for a coach service to Coste.

MANCHESTER.—Application has been made by the Tramways Committee to the district councils of Bucklow and Sale for licences to run omnibuses between Northenden and the tramway terminus at Sale.

HEREFORD.—During the Musical Festival the Hereford Transport Company and the Birmingham and Midland Omnibus Company provided special evening services from numerous towns and villages at cheap fares.

PRESTON.—The Tramways Committee have decided to establish an omnibus service between the Central Station and Lytham Road, and authorised the engineer to obtain tenders for the supply of three omnibuses.

EDINBURGH.—In view of the reduction of about 1s. 6d. in the £ in the employees' wages, the Tramways Committee have recommended an increase in the length of the penny stages of the tramways and omnibuses.

SHEFFIELD.—The general manager of the Corporation Tramways has been authorised to approach the Stocksbridge Urban Council for sanction to extend the Stocksbridge motor omnibus service beyond the present terminus.

LANCASTER.—The Watch Committee have considered an application by the Pilot Motors, Limited, of Preston, for permission to run an omnibus service from Preston to Lancaster. The committee have asked for further particulars.

TYNESIDE.—On September 7, the Tyneside Tramways Company began a service of omnibuses from the Whitley Bay terminus to Blyth, a distance of seven miles along the coast. The service provides an alternative to the railway route to Newcastle.

GLASGOW.—The Tramways Committee have decided that the general powers to be asked for in the Provisional Order to run motor omnibuses outside the city should, with the exception of one route, be limited to a radius of ten miles from the centre of the city.

BLACKBURN.—In giving a licence to ply for hire with omnibuses in Blackburn in connection with a service proposed to be run to Guide and Belthorn, the Watch Committee have stipulated that the service be terminated on six months' notice being given by the Corporation.

YORK.—The Tramways Committee have asked a sub-committee to report as to the cost of running omnibuses and railless trolley vehicles, so that the whole subject can be considered before the City Council come to a decision in regard to a proposed omnibus service to Clifton.

MERIONETH.—The County Council are asking the County Councils Association and all the Welsh County Councils to support them in their request to the Ministry of Transport that legislation should be introduced to deal with the weight of motor coaches, in view of damage to the roads.

HORSHAM.—The Urban Council have received a request from the Southdown Motor Company that eight standing passengers should be allowed in their vehicles (single deck), as is the case in the area of the Worthing Corporation. It was decided that excess passengers should be permitted only on the Worthing route.

MERTHYR TYDFIL.—The Town Council, who have been considering the establishing of an omnibus service, have referred to a sub-committee the question of the purchase of vehicles. Meanwhile the Council have refused to grant any new licences for the running of omnibuses, and one firm has lodged an application at the Ministry of Transport.

DURHAM.—The United Automobile Services, Limited, in view of the Roads Act, have protested to Durham Rural District Council against the refusal to permit their vehicles to run between Durham and Thornley. The Highways Committee based their decision on the condition of the roads, and the surveyor stated that the Committee's action was supported by the Ministry of Transport. The Council deferred consideration of the letter.

LEIGH.—The Ministry of Transport have held an inquiry into the application of the Town Clerk to borrow £10,000 for the purchase of six additional omnibuses, including four light machines, and £4,600 towards the cost of providing a garage. It was mentioned that six omnibuses had been in operation since November last, and had proved so popular that, but for the trade depression and the coal strike, the services would have produced a profit.

DUNDEE.—The magistrates have granted the Will Transport Company a stand in Courthouse Street, for an omnibus service to connect the city with Monikie. At the hearing of the application a magistrate remarked that the running of omnibuses by private firms had affected the tramway revenue, and the town clerk said that if a specific case of passengers being picked up and set down within the city boundary was obtained he would be glad to have particulars.

LONDON.—The London General Omnibus Company propose to extend a service from Wood Street to Highams Park, but though it is now unnecessary to obtain the consent of the local authority, the General Purposes Committee of the Walthamstow Council suggest approaching the Ministry of Transport to secure a maintenance grant for the route over which the extended service will run. St. Pancras Council are asking the Ministry to prohibit new services over macadam roads.

WEST OF ENGLAND.—The Bristol Tramways and Carriage Company, Limited, and the National Omnibus and Transport Company, Limited, are applying to the various local authorities for consent to new motor services, linking up such places as Swindon, Chippenham, Cirencester, Burford, Faringdon, Newbury, Marlborough, Devizes, and Trowbridge. Owners of motor vehicles in Swindon have notified the Swindon Corporation that they "view with alarm" the proposal.

MOTOR VEHICLES FOR MUNICIPALITIES.

BLACKBURN CORPORATION have purchased a Dennis fire engine.

ROTHERHAM TRAMWAYS COMMITTEE have invited tenders for a railless chassis.

BILLINGE URBAN COUNCIL are considering the advisability of purchasing a wagon.

ROTTERDAM MUNICIPALITY have purchased a Karrier street sweeper and dust collector.

ISLINGTON BOROUGH COUNCIL propose the purchase of another Laffly road sweeper at £1,100.

MANCHESTER CORPORATION have taken delivery of a Karrier street sweeper and dust collector.

LEEDS CORPORATION have invited tenders for the supply of two wagons for the Gas Department.

BURNLEY ELECTRICITY COMMITTEE recommend the purchase of 1-ton van. There were thirteen tenders.

CALCUTTA COUNCIL have ordered six 5-ton hand-operated side-tipping trailers from John I. Thornycroft, Limited.

ISLINGTON CLEANSING COMMITTEE propose the purchase of four 2½-ton Edison vehicles at £1,525 each, and a Karrier petrol lorry at £1,275.

JOHANNESBURG COUNCIL have referred back for further consideration a proposal for the purchase of six Sentinel steam wagons at £1,500 each.

HARROGATE COUNCIL have appointed a committee to report on a proposal by the surveyor to purchase a 5-ton electric tipping wagon for the electricity works.

BOLTON CORPORATION have instructed the borough engineer to prepare plans for the erection of a garage for the lorries and petrol roller, and for the installation of an underground petrol plant.

BOURNEMOUTH BOROUGH ENGINEER, reporting on the first month's working of the three motor dust vans, declares that the result shows a considerable saving over the old method of collection.

LEYTON URBAN COUNCIL have received a report from a sub-committee recommending, in connection with the collection and removal of house refuse by motor vehicles, that the drivers should be held responsible for the conduct and work of their crews, especially as the higher wages paid to the drivers warrants this authority.

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MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

THE ROAD TO SOUTHEND.—Essex county surveyor has prepared a £50,000 scheme for resurfacing the London-Tilbury-Southend main road.

AMERICAN TRUCKS REDUCED IN PRICE.—Reductions averaging $500 have been made in the prices of motor trucks by numerous American manufacturers.

ROUTES FOR COACHES.—Eastbourne Highways Committee have directed the borough surveyor to request proprietors of motor coaches to restrict their vehicles as far as possible to tarred roads.

A CONFERENCE ON COACH STANDS.—Northern local authorities have convened a conference with a view to uniform action being taken to provide stands for coaches, motors, etc., and to fix appropriate charges.

ONE-WAY THOROUGHFARES.—Chesterfield Corporation have decided to restrict the use of Packer's Row to descending traffic only. People driving up will be liable to prosecution for "driving to the danger of the public."

SPRING FLOOR FOR COACHES.—Mr. D. Doig, of Messrs. Doig and Sons, picture publishers, of New Bond St., W., has invented a coach floor to be suspended on springs, acting vertically and horizontally. The object is to free passengers from road shock.

VEHICLES AFTER SUNSET.—Since the repeal of the "war" regulations there are in Glasgow many vehicles exempted from carrying lights after sunset, and the Corporation propose to seek Parliamentary powers to enable them to compel all vehicles to carry lights.

COMMERCIAL VEHICLE EXPORTS.—The total value of commercial motor vehicles (including omnibuses, fire engines, and ambulances) exported during the eight months ended August 31, 1921, was £475,315. During the same period last year the value was £510,674.

SMOKE FROM ROAD ENGINES.—In their new Bill, Glasgow Corporation propose to seek permission, in regard to the emission of smoke from mechanically-propelled vehicles, to provide that the penalty for the first offence shall be £5, and £10 for second or subsequent offences.

ALTERNATIVE TO TRAMWAYS DURING A STRIKE.—During the six days' strike of Salford tramway employees the Corporation issued special licences to motor coaches, with the result that more than 100 vehicles from Salford and other towns were put in service. The fares were fixed by the local authority.

FERRO-CONCRETE MOTOR SHEDS.—Gloucestershire County Council are erecting more ferro-concrete sheds for garaging their increasing motor fleet, which now comprises ten Halley petrol lorries, one Thornycroft petrol lorry, twenty-six Foden steam wagons, five Garrett steam lorries, and three Clayton steam lorries.

SUGGESTIONS FROM TRAFFIC EMPLOYEES.—The Underground management received 344 suggestions from its staff during the month of August. Among the most useful were those for improvements in train running, for dealing with heavy traffic in East Ham by motor omnibus, for methods of economising in the use of electric current, and for new motor omnibus routes.

ECONOMY EFFECTED BY BULK STORAGE.—The construction of an underground petrol storage tank has been advocated by a committee of the Sheffield Corporation at a cost of £187, plus £100 for foundations. By this method it is estimated that 10s. per barrel can be saved by eliminating the loss from evaporation and filling. Adding the reduced charge for bulk quantities, the total saving is reckoned at £40 per annum.

NEW SERVICES ON OLD ROADS.—The 1920-21 report of the Gloucestershire County Council calls attention to what it describes as "a serious feature"—the initiation of new omnibus routes over old roads before the Council have been able to reconstruct them for such traffic. "Such undue haste in opening up new routes," the report states, "depreciates roads which will take years to restore at very great cost."

A NEW BRIDGE IN ESSEX.—Springfield iron bridge is to be reconstructed at a cost of £3,500. The cast-iron structure over the river near Chelmsford carries the main road from London to Colchester and Ipswich, and is one of the most heavily utilised roads out of London. It has caused anxiety owing to vibration under heavy loads. The county surveyor says the ribs of the bridge are of cast iron placed there 120 years ago.

SCRAP THE TRAMCAR.

TO THE EDITOR OF "THE TRAMWAY AND RAILWAY WORLD."

Sir,—It is interesting and enlightening to learn from the reports of the meeting of the Municipal Tramways Association, recently concluded in Salford, that tramway managers are generally agreed that tramways at the present time are not paying their way, and that if and when the necessary reconstruction and renewals have been effected, and supposing that necessary additional facilities have to be provided by laying additional track and erecting additional equipment, the loss on any such undertaking would inevitably be enormous. At present, quite small as well as large motor omnibus services are being operated at a satisfactory rate of profit; for instance, in one case a provincial omnibus company, whose prospectus appeared in the newspapers recently, has a certified average net profit of 35 per cent. per year for the past eight years.

The tramway managers complained at the conference of the unfair competition of omnibuses, but is it not a fact that, except in the case of London, local authorities, before licensing an omnibus service which overlaps their own tramways service, insist on such a scale of fares as will prevent all except long-distance passengers from using the omnibus in preference to the tramcar? On the score of taxation the omnibus nowadays has nothing in its favour. The public interest is that the best vehicle should win.

At the conference a general adoption of the trolley omnibus was advocated; surely this will be a very retrograde step. So far as published figures are available, it would appear that the total costs of running petrol omnibuses and trolley omnibuses are about the same, but every practical person must be fully aware that the earning capacity of the petrol omnibus is vastly greater, in that the line of route can be changed either from day to day to suit local traffic conditions, or from year to year by accommodating the growth of the neighbourhood. In addition, the petrol omnibus can be used at week-ends and for special parties and holiday excursions; it comes to the footpath to pick up its passengers, and that alone is a very great convenience to the public and a time saver on the trip. Regarding speed, the omnibus is much superior, and is more mobile than the trolley omnibus; it can get through traffic more quickly and make quicker "stopping" trips than any vehicle attached to wires. From the point of view of the convenience of other traffic, the independent omnibus has it all its own way.

Your older readers will remember the great outcry which was raised at the beginning of the electric tramway era against overhead wires. Undoubtedly they are a great disfigurement to a town, and, other things being equal, a system which does not necessitate their continuance in the street will most certainly be adopted in the end. The trolley omnibus is an intermediate stage and a compromise only. In the case of the trolley omnibus we should be afflicted with at least twice as many as exist at present.

There is another consideration which many Corporations have to consider, and that is the extension of their electrical plant for general lighting and power purposes, at a time when plant costs in the neighbourhood of 250 per cent. higher then pre-war figures. Is it not going to be desirable, in order to avoid such expenditure, to use power plant now devoted to tramway purposes for other purposes on an increasing scale, spending part of the money that will be necessary for tramway renewals and extensions on fleets of motor omnibuses, thus improving the appearance of towns, reducing the total expenditure and giving a quicker and quieter service?

People have become so much accustomed to the tramway now that unless their attention is drawn to the fact they do not perhaps realise the shattering noise which is made by a tramcar as compared with an up-to-date omnibus. In a quiet district a tramcar can be heard over a distance of four or five miles during its journey, whereas the omnibus is quite inaudible except just at the moment of passing.

The object of this letter is to point out to ratepayers that now is the time to approach their representatives on the various Councils with a view to stopping all further expenditure on tramways and the purchase of privately owned tramways by municipalities. In its stead it is progressive policy to foster the inauguration of well-equipped omnibus services, which will certainly and ultimately replace the tramways as extensions and renewals become necessary. Startling as it may seem, it would be wise, before tramway finances become more and even more burdensome, to adopt a definite policy of abandoning the whole of the tramway undertaking at the earliest possible moment, and as an alternative not to tinker with the trolley omnibus.—Yours faithfully, p.p. LEYLAND MOTORS, LTD.—C. B. NIXON, Director.

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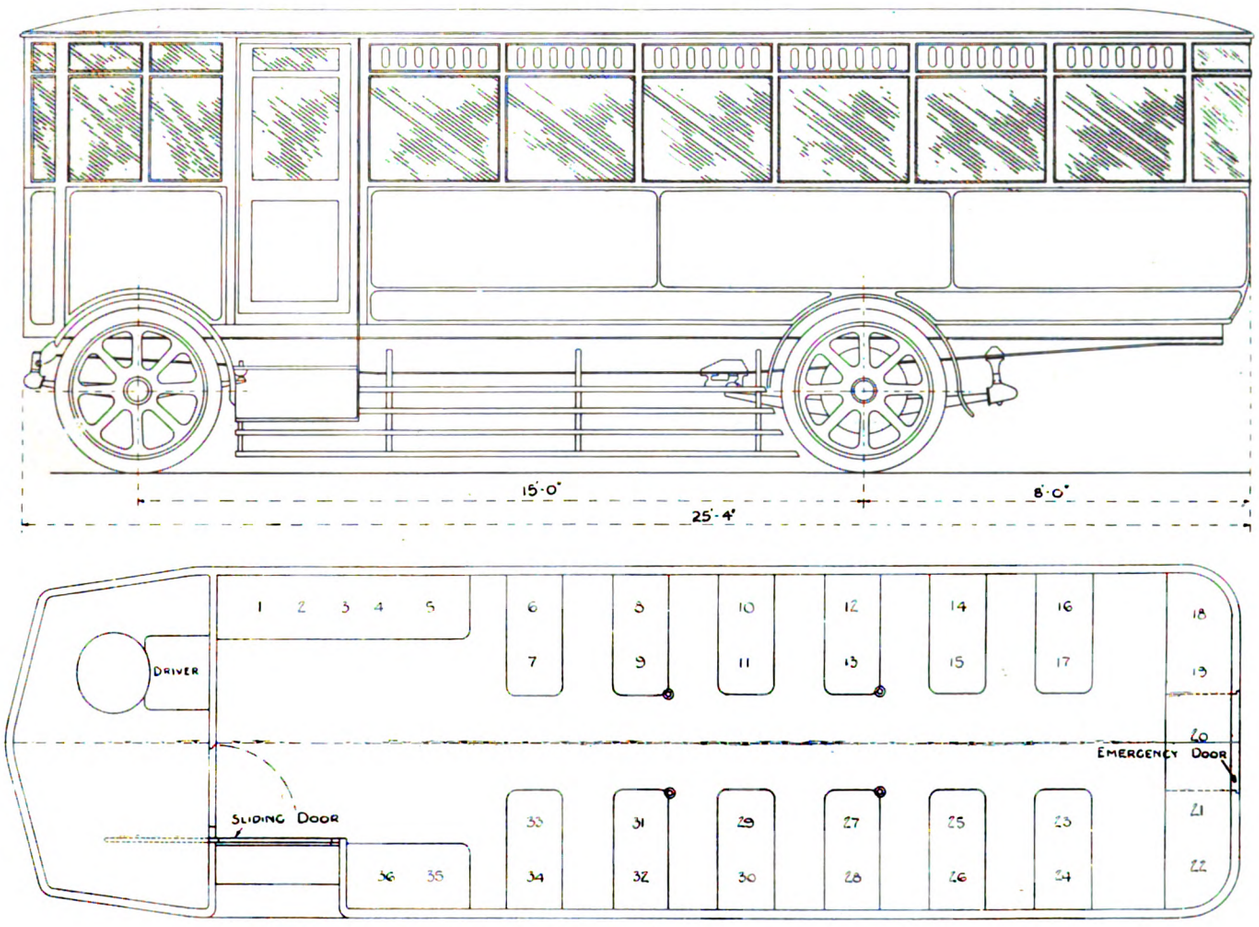
THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, NOVEMBER 17, 1921. VOL. L.

TROLLEY OMNIBUS DEVELOPMENTS.

THE NEW "STRAKER-CLOUGH" PRODUCTION.

The trolley omnibus may well be described as the silver lining of the present electric tramway cloud, for this form of traction is probably destined at no distant date to provide a solution of many of our electric traction difficulties. Tramway undertakings have been brought face to face with hard economic facts from which there is no escape. Many experiments have taken place since the "War" in the adjustment of fares to meet the increased cost of operation, but the economic limit to these increased fares has been found to be 1½d. per mile, and when a fare exceeding this is introduced the actual result is often a reduction in revenue. Bitter lessons have had to be learned. Those who had only a superficial knowledge of economic difficulties, were under the impression that when our railways introduced their first increase of 50 per cent. the revenue would be increased at a similar ratio. It was found, however, that the actual increase in revenue was only 13 per cent.



Elevation and Plan of the New Straker-Clough Trolley Omnibus.

The problem in connection with electric tramways owned by municipalities is therefore how to operate them with fares not exceeding 1½d. per mile without making a call upon the rates, but for company-owned undertakings the position is obviously of a very much more serious nature. Most of our electric tramway systems are also at the present time faced with the heavy outlay involved in the reconstruction of their

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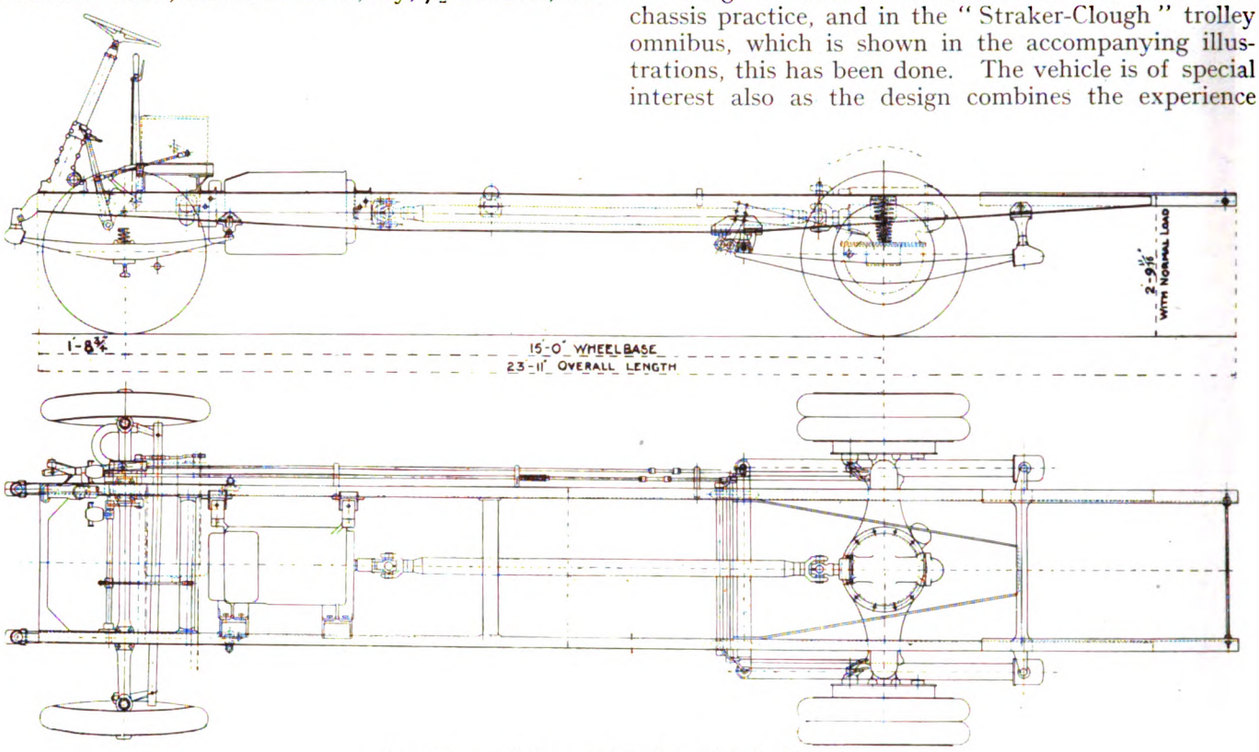
tracks, the cost of which figures out between £40,000 to £50,000 per mile of double track, and in many cases their coffers are empty.

At the lower estimate, and allowing a life of 20 years for the new track, and a service of, say, 7½ minutes, the interest and sinking fund charges alone work out at over 8·75 pence per car-mile, which figure itself is in excess of the cost of maintaining a modern trolley omnibus, including tyres and current consumption. When the question of expending an average of £40,000 per route mile for track reconstruction is under consideration, it should be borne in mind that for a much smaller capital expenditure a fleet of new trolley omnibuses could be provided, and the existing tramway overhead equipment adapted to this new form of traction. Fortunately during the past ten years valuable experience has been gained in connection with the operation of the trolley omnibus, and it seems clear that this vehicle is now able to rescue many electric tramway undertakings that are in financial difficulties.

The experience that has been gained in the operation of trolley omnibuses indicates that it is desirable in the design of these vehicles to follow standard motor chassis practice, and in the "Straker-Clough" trolley omnibus, which is shown in the accompanying illustrations, this has been done. The vehicle is of special interest also as the design combines the experience gained by Messrs. Clough, Smith & Co. Ltd. during the past ten years in the construction of the Tees-Side, Keighley, Aberdare, and Ramsbottom trolley omnibus systems with the wide experience of Messrs. Straker-Squire, Limited, in the manufacture of chassis of every variety during the past 20 years. This new trolley omnibus is also the outcome of the operation for a period of over 12 months of two distinct types of trolley omnibuses upon the same system. One type was fitted with two motors, and a hand-operated controller, the other type with one motor and a foot-operated controller. These vehicles are in service upon the Tees-Side Railless Traction System, which is the largest self-contained system of the kind in this country.



Elevation and Plan of Straker-Clough Chassis

Perspective View of Chassis.

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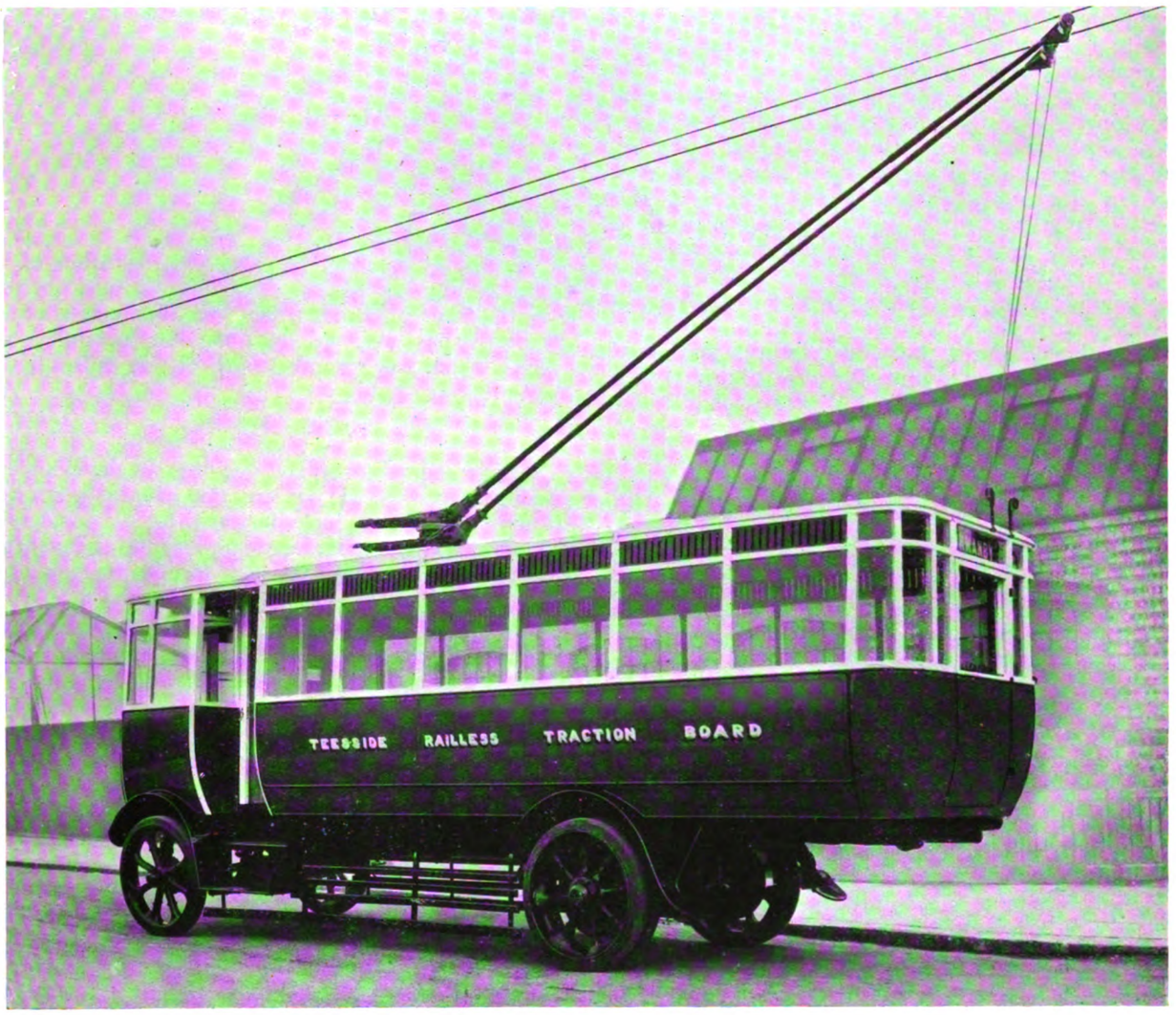
After exhaustive records had been taken of the performance of these two types of vehicles, it was decided to adopt the single motor drive, and foot-operated controller. This decision was subsequently confirmed by one of the largest manufacturers of traction motors.

The objective before the designers of this trolley omnibus was to place upon the market a reliable vehicle that could be operated both upon the mechanical and electrical side at the lowest possible cost. If the records of the earlier trolley omnibus undertakings be carefully studied, it will generally be found that the cost of the maintenance of the vehicles formed a large proportion of the total. Should one probe into the matter it will also be found that these high maintenance costs were due to mechanical, and not electrical, defects in the design of the chassis.

The designers of the "Straker-Clough" trolley omnibus have aimed not only at reducing the maintenance cost, but at the same time at considerably increasing the life of the vehicle. Several of the earlier trolley-omnibus undertakings are at this date spending large sums upon keeping their original vehicles in service, rather than replacing them with new machines of up-to-date design, requiring a lower expenditure in maintenance. The economic life of an omnibus is passed when the high maintenance expenditure of an old vehicle exceeds the interest on the capital outlay and lower maintenance of a new vehicle. We are afraid the truth of this axiom is not fully appreciated.

A very important question to be considered in the purchase of a trolley omnibus is the facility for obtaining prompt delivery of spare parts, and at the manufacturer's standard prices. Those closely associated with the management of the earlier trolley omnibus undertakings have found that, owing to the adoption of a chassis of special design, manufactured in very small quantities, the cost of spare parts has been considerably in excess of the prices that would have applied to a standard chassis. For instance, it is impossible to turn out a special motor in, say, lots of one dozen, at the price of a traction motor manufactured upon a mass production basis. To operate a trolley omnibus at the lowest expenditure per mile it is also necessary to obtain prompt delivery of spare parts, so reducing the time a vehicle is under repair to a minimum, in order to avoid the capital outlay of the vehicle remaining unremunerative.

The first of the new "Straker-Clough" trolley omnibuses has been supplied to the Tees-Side Railless Traction Board, and the accompanying illustrations show the general design of the body and chassis. The body has been manufactured to the special design



The New Straker-Clough Trolley Omnibus with Double Trolley.

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of the general manager of the Tees-Side Railless Traction Board, Mr. J. B. Parker, who has given very careful consideration both to the accommodation of the maximum number of passengers (36 in all), and to their general comfort. It will be observed that the vehicle has a front entrance. Although this allows for single man operation, the traffic on the Tees-Side system is so dense that a conductor is essential. At busy times 15 vehicles are required for the service on just over five miles of route.

The positive and negative trolley poles are each 18 feet in length, are mounted on a single base, and revolve from the one centre. This particular design was first put into operation in 1914, and has proved itself to be one of the most efficient on the market. By mounting both bases upon the same vertical axis, not only is a considerable reduction in weight effected, but a longer reach is given from the trolley wires for a given length of pole. The two standards are fitted with ball bearings, which allow for equal freedom of movement of the trolley poles in both directions. The trolley base is fixed to the roof immediately above the centre line of the wheel base, this position being what might be described as "amidship" and results in the movement transmitted to the base due to the steering of the vehicle being reduced to a minimum.

The controller is of the foot-operated type and is fitted with rheostatic braking for forward and reverse. The vehicle has therefore three brakes—hand, foot, and electric. The foot-operated controller allows the driver to have both hands free for the steering of the vehicle. It will be readily seen that with a trolley omnibus fitted with a hand-operated controller of the tramcar type, the driver is compelled to steer the vehicle with the one hand when using the controller, which is of course a practice to be avoided, especially so in an emergency when accurate steering is essential.

The vehicle is lighted by means of ten 16 c.p. 110-volt lamps, there being two series of five lamps on the 550-volt supply. In the event of an interruption to the main supply, auxiliary lamps are fitted to the two head and tail lights, the current for which is obtained from a 60 amp. hour accumulator. The trolley omnibus is also supplied with a watt meter and speedometer. These instruments may be considered to be somewhat of a luxury, but working in conjunction with each other afford a very efficient check upon the extravagant use of power by careless drivers.

The tyres are of Dunlop manufacture, and of their latest super resilient type. This is really a compromise between the ordinary solid rubber and pneumatic tyre, and has an advantage over the latter type in cost of maintenance. The cost of maintaining the resilient tyre varies from ¾d. to 1d. per car-mile, as against the estimated cost of 3d. for the pneumatic. The latter figure being based upon a life of 10,000 car-miles. Pneumatic tyres for a vehicle of this type are, however, still in the experimental stage and it is doubtful whether the weight to be dealt with would not be in excess of the strength of any giant pneumatic tyre at present on the market.

A stage has now been reached in the development of the trolley omnibus which enables reliable figures of the cost of operation to be obtained. These vary, of course, in accordance with the size of the system, frequency of service, and cost of electric power. The maximum current consumption can be taken at 1·25 units per omnibus-mile as measured at the point of supply, inclusive of line losses, but exclusive of the lighting of the depot and offices which are usually fed from the same supply.

The saving in working cost over the petrol omnibus and tramcar is again dependent upon the service to be catered for. Taking an average service of 7½ minutes the following comparison can then be made.

	Per Car-mile. *Pence.*
SAVING ON TRAMWAY—	
Maintenance of track	½
Interest and Sinking Fund charges	8¾
	9¼
SAVING ON PETROL OMNIBUS—	*Pence.*
Petrol	6
Additional maintenance of petrol engine over electric motor	½
	6½
DEDUCT FOR THE TROLLEY OMNIBUS—	
1·25 units at 1½d. per unit	1·88
OVERHEAD EQUIPMENT—	
Maintenance (2 pairs trolley wires) ...	·39
Interest and Sinking Fund charges ...	·73
	3
	3½

The above saving in cost in the operation of the trolley omnibus extended out at the total miles operated by one of our principal trolley omnibus undertakings, during the past year, viz., 364,789 omnibus miles, on a system which has a route length of five miles, figures out as follows—

Total saving per annum over tramway ...	£14,059
,, ,, ,, petrol omnibus ...	£5,320

We are at present on the eve of great developments in connection with the construction of large generating stations, and may look forward to a considerable reduction in the cost of electric power in the near future, which is all in favour of this new form of traction.

Messrs. Clough, Smith and Company, Limited, 36, Victoria Street, Westminster, London, S.W.1, are sole agents for the supply of the "Straker-Clough" trolley omnibus.

WORK OF THE ELECTRICITY COMMISSIONERS.

Anyone who wishes to know all about the powers and duties of and the work so far accomplished by the Electricity Commissioners (constituted under the Electricity (Supply) Act, 1919), cannot do better than study the first annual report of the Commission (H.M. Stationery Office, 3s. net), which has now been published. The report covers the period from January 31, 1920, to March 31, 1921. It is consequently not quite up to date. The document will have a future, as well as a present, value, because it is hardly likely that the historical survey of electricity supply and the details of the powers and duties of the Commissioners will be repeated in future reports. As to the work which the Commissioners have already accomplished in helping and regulating the development of electricity supply, it is considerable, though of course much of it is of a preliminary kind. The Commission are hampered by the failure of the Government so far to pass into law the promised Bill for giving financial powers to the joint district electricity authorities to be set up, but meantime the delimiting of districts and the evolving of supply schemes for them goes on. The report shows, too, how great is the mass of detail with which the Commission have to deal; it is, in fact, an illuminating document.

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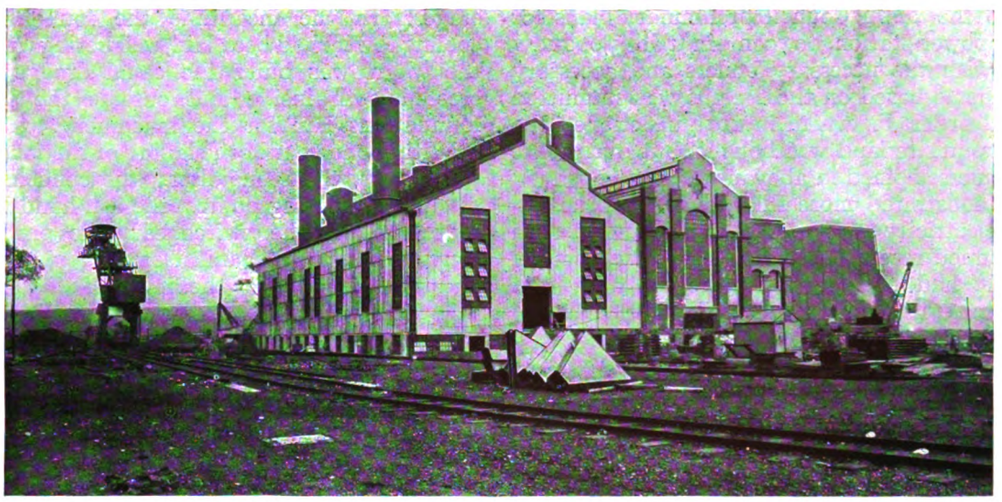
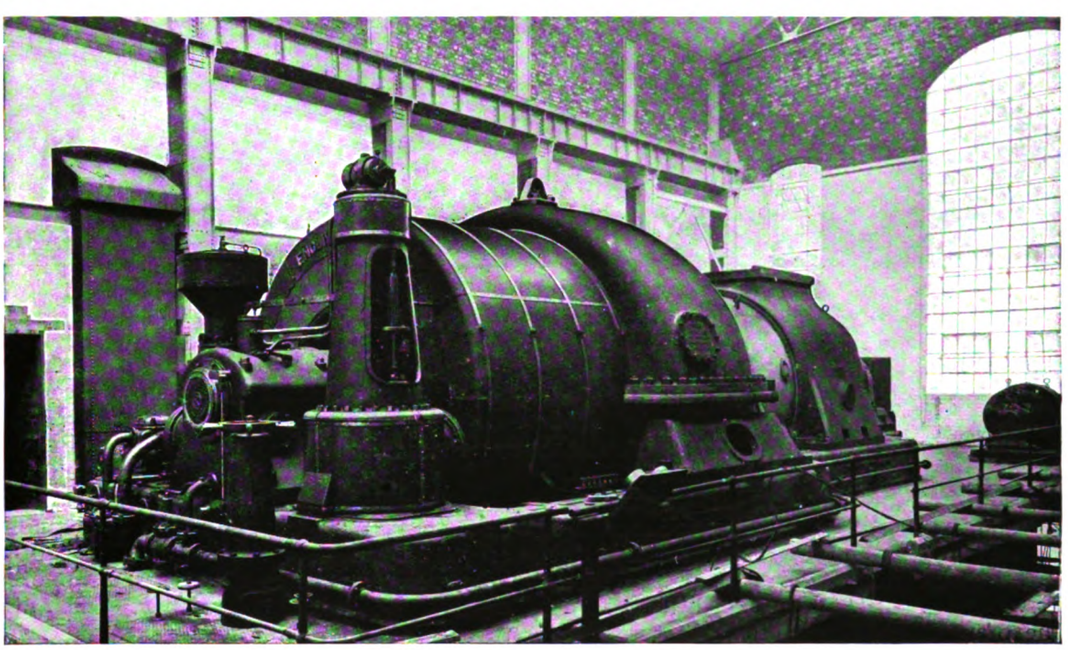
THE NEW BLACKBURN POWER STATION.

The new Blackburn (East) generating station, which was formally opened on October 21, is one of the most notable additions of recent years to the electric power capacity of the country. During the war nothing of course could be done towards developing electrical supply, except for the purposes of industries associated with the prosecution of the fight against the enemy. Even now the country is still struggling to get its wind, so to speak, and as regards the developing of electric supply the Blackburn station may be regarded as a forerunner of general recovery.



New Blackburn Generating Station.

In a pamphlet issued by Blackburn Corporation, who are the owners of the new station, it is described as the first super-power station to be built under the auspices of the Electricity Commissioners. This somewhat vague statement seemed to require elucidation, and on inquiry we have obtained the needed enlightenment from a representative of the Commission. The original scheme for the station dates from the years immediately preceding the war, when of course no Electricity Commissioners were in existence. That body, however, was constituted before the revised and enlarged scheme could be carried out. Part of the duties of the Commissioners is to consider all schemes for new power stations, and to sanction such as are calculated to fit in as part of general electrical development schemes for each electricity district. Blackburn is situated in the Mid-Lancashire Electricity District, delimited by the Commissioners, and the revised plans for the new power station were submitted to and approved by the Commissioners. Before giving approval they had, of course, to see that the arrangements were such that they could form part of a co-ordinated scheme of supply for the whole district when that comes to be developed. It is in this sense that the station has been erected "under the auspices" of the Commissioners.



10,000-k.w. Turbo-Alternator (Turbine End)—New Blackburn Generating Station.

Before the war the need for an increased electric power supply had been occupying the attention of the

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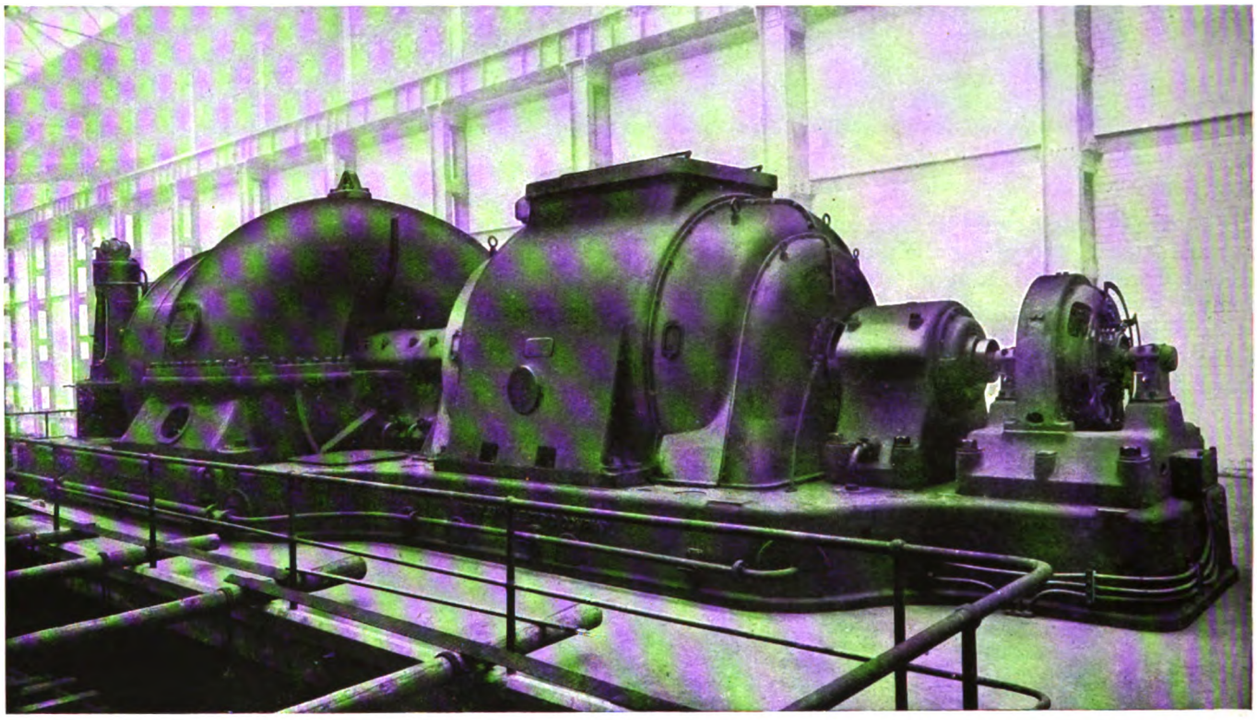
Blackburn Electricity Committee. In the days when current was wanted only for lighting purposes, the old generating station, with poor facilities as to coal and water, had to suffice, but the growing demand for electricity for traction and general power purposes called for development. In 1912 Mr. P. P. Wheelwright, engineer and manager of the electricity department, submitted to the Town Council preliminary plans for a complete power-station to contain two 5,000-K.W alternators, with the necessary boilers and accessory plant. A scheme based on these plans was submitted to the Board of Trade, which in 1914 sanctioned the work. The requisite land was bought, but during the war the scheme remained in abeyance. That interval, however, demonstrated more fully than ever the advantages of electricity for power purposes, and in 1919 when the Council reconsidered the plans, the demand for electricity had become much greater than that anticipated in 1914. It was accordingly decided to provide a station of double the capacity of that originally intended, and two turbo-alternators of 10,000 KW. each were provided for.

Tenders for the comprehensive carrying out of the plans were invited, and that of the English Electric Company was accepted by the Council in August, 1919, and work was begun immediately under the supervision of Mr. Wheelwright on behalf of the Electricity Committee. Credit is due to Mr. F. G. Mitchell, of the Mitchell Conveyor Company, for the expeditious manner in which he prepared designs of the structure. The steel work was ordered within the first month of the contract, and during erection no radical alterations were necessary.

The ground forming the site of the station was waterlogged, and some form of artificial foundation had to be employed. In preference to erecting a building on piles, it was decided to construct a concrete raft, and a special line of broad gauge railway 1,000 yards long was laid from the gasworks sidings to the site to facilitate the bringing up of the material. The raft was completed and the foundation stone was laid on May 13, 1920. After this the progress was rapid; two months later the steel columns were up; in another two months the steel structure was complete, while before the end of the year the whole buildings, both boiler house and power house, had reached their final stages. In the meantime the foundations for the cooling towers had been laid, well boring was progressing, the wharf was built, the canal dredged, the cranes erected both inside and outside the building, and foundations laid for the machinery.

Within one year of the laying of the foundation stone the boilers, the economisers, the condensers, the feed pumps, circulating pumps, the ash-handling plant, the soot blowers, the switchgear, the cranes, the coal conveying and mechanical stoking plant, the turbine and the alternator for the first half of the station were delivered, and on October 21 that half was started up by Lord Derby. It is expected that the station will be completed and in final running condition before the spring of next year.



10,000-k.w. Turbo-Alternator (Alternator Eno)—New Blackburn Generating Station.

Coal and Ash Handling Plant.

Special care has been taken to ensure that the supply of coal shall be economically handled. Delivery can be made either by canal or rail. The handling plant is of special design, which was selected after care had been taken to make certain that no other method would give greater efficiency. The main 20-ton travelling crane is the feature. A full railway wagon is lifted by the crane, weighed by the crane operator, discharged into the coal hopper or on to the heap, and the empty wagon weighed again before being replaced on the track, so that the net weight of coal is ascertained. This arrangement reduces the labour costs considerably, only one crane operator being necessary for discharging the wagon and weighing the coal, thus cutting out the usual weighbridge with capstans and attendants, and the shunting that is necessary when

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employing ancient methods. The coal is discharged direct from the truck to the heap without passing over the usual elevators and conveyors.

When the coal is not required for stock it is discharged direct by the crane into the receiving hopper of the skip hoist. The skip hoist and belt conveyor work automatically, one ton of coal being fed by weight

20-ton Travelling Coal Crane.

into the skip every time it is elevated. The operations are counted, so that a correct record of the amount of coal passed up into the bunkers is kept. In addition to having low power consumption, it is found that the upkeep and general repair cost of a skip hoist are very light compared with any other form of elevating gear. This skip hoist delivers the coal on to a Mitchell belt conveyor, which distributes it to any portion of the bunker, which has a capacity of 200 tons, or about sufficient for 48 hours' steaming on full load.

When unloading from barges or reclaiming coal from store, an electric grab is attached to the 20-ton crane by simply hooking it to the crane ropes. The power for closing the spades is provided by a motor inside the claw of the grab itself, which makes it possible for the same grab to be attached to any other crane, and to retain all the advantages of a double rope grab.

For removing the ashes from the boiler house an electric battery locomotive is employed; this hauls a specially designed truck under the ash pit door, where it is filled. After loading, the locomotive takes the truck to a patent distributor outside, where the ashes are discharged on to a moving belt which distributes them over the surrounding ground. By the arrangement of the distributor a wide area of discharge is obtained, and the one man who drives the locomotive also attends to the distribution of the ashes on the ground which has to be made up. On the present site the amount of ground which has to be made up is considerable, so that a dump for ashes is provided for many years. A fixed-radius jib crane is also provided for use in the event of the 20-ton crane being out of commission. This is fixed in position near the canal wharf so that the path of the radius arm covers both the barges moored alongside and the underground hopper.

Boiler Plant.

The boiler room plant comprises seven boiler units of the Babcock & Wilcox type, each having a steaming capacity of 50,000 lbs. per hour as a normal duty. Each unit is fitted with a superheater and superimposed Green economiser of the horizontal tube type and three mechanical stokers of the underfeed self-contained, forced-draught, travelling-grate type. Coal is fed to the stoker hoppers from the overhead bunkers through chutes fitted with control valves. The coal burnt by the stoker is measured as it passes into the furnace by Lea coal meters attached to each stoker. The ash and clinker from the stokers is dropped into special ash chutes built to the underside of the stokers and is emptied into trucks running on a special track fixed in the boiler room, whence it is conveyed to the distributor. Steam is generated at a pressure of 210 lbs. per sq. in. and superheated to a total temperature of 600 deg. Fahr.

Each boiler is provided with a polished enamelled slate panel carrying two steam-flow recorders and indicators; a CO_2 indicator; a dial draught gauge; a pressure recorder; and a six-way temperature indicator for registering the temperatures of the economiser inlet and outlet water, economiser inlet and outlet flue gases, and the steam temperature at the superheater box.

The boilers are operated on the balanced draught system. The stokers are provided with separate forced draught fans, and the chimneys are divided into two portions at their lower sections and fitted with induced draught fans which draw the gases of combustion down one section of the chimney from the outlet of the economisers and discharge them upwards through the other portion of the chimney. This arrangement ensures the maintenance of efficient combustion with fuels of varying heat values. Each boiler unit is fitted with a soot cleaning equipment, consisting of a rotary device for directing steam at high velocity on to the tubes while the plant is in operation. These appliances are so situated that the whole tube area is covered by the

Electric Locomotive Used for Hauling Ashes.

rotary jets, which are periodically operated by hand. This is the first large power house in Britain to be equipped throughout with this plant.

The circulating water for the surface condensers, after passing through the condensers, is pumped into four cooling towers, where it is cooled down to a temperature of about 75 deg. Fahr. A pond is constructed

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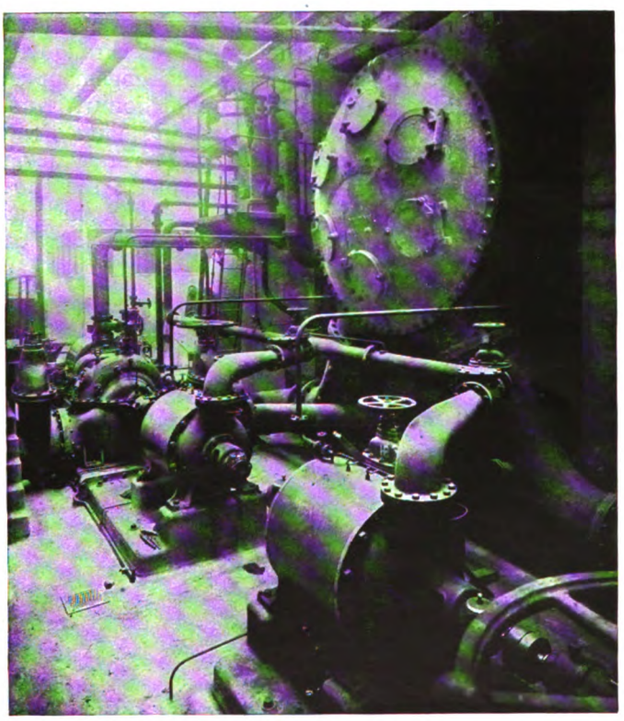
under each tower, from which the circulating pumps draw their supply. The only new water to be provided, therefore, after the initial starting up, is that necessary to make up the losses caused by evaporation and wastage, which will be obtained from a well sunk near the cooling ponds. Condensing water can also be taken from the canal and afterwards returned.

General View of Switchboard.

The pipework between the pumps and towers is interconnected so that it is possible for either pump to draw water from or discharge it to any one or more of the four towers. An emergency supply tank is provided, situated upon the roof; this has a capacity of about

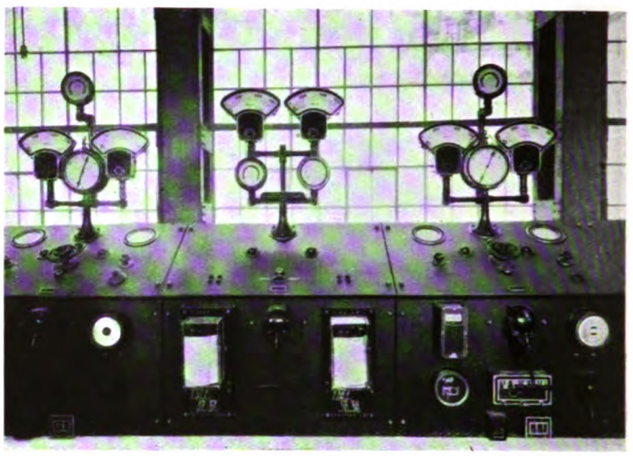


Condenser and Pumps.

18,000 gallons. This tank will also be used for emergency water supply for any point of the station. In the turbine house a 60-ton overhead electric travelling crane is erected, fitted with an auxiliary hoist of 10 tons capacity.

Turbo-Alternators.

The turbo-alternator plant consists of two 10,000-kw. impulse turbines and 6,600-volt, 50-period, 3-phase alternators supplied with cool washed air from a patent air filter. Each set is complete with surface condenser, extraction pump, circulating water pumps, etc. The steam from the turbines after being condensed is passed through a "closed feed system." The condensed steam



High Tension Switchboard—Alternator Panels.

is fed direct to the suction of the turbine-driven boiler feed pumps, which feed the water directly to the inlet of the economiser, where it is heated during circulation by the combustion gases. The delivery into the boilers is regulated automatically by Cope's feed regulators. There are three turbine-driven boiler feed pumps, each capable of supplying three boiler units, so that with the whole station in operation there is one spare feed pump.

Switchgear, Etc.

The electricity generated is controlled by an extra-high-pressure switchboard. The switchgear comprises separate cubicles for the e.h.p. gear, situated in a separate cell room, immediately below the control desk. The control board is of the desk type, and is mounted in the switch room, while the operating levers pass through the switchroom floor into the cubicle room below. The gear is designed to have a breaking capacity suitable for direct connection to bus-bars supplied by generating plant of much larger capacity.

For the auxiliary plant, alternating-current supply will be transformed down to 400 volts by three 500-kw. transformers, which are connected to the low-pressure a.c. switchboard.

To provide a supply for the d.c. motors and station lighting there are three 320-kw. rotary converters, which draw their incoming supply from the 400-volt a.c. board and supply d.c. to a 400-volt switchboard. These rotary converters are arranged so that in the event of the main generating sets not being in operation they can be operated by a supply from the old station.

The Town Council, Mr. Wheelwright, the English Electric Company, and the sub-contractors are to be congratulated on this up-to-date station.

Railway Electrification in Japan.—Reuter reports that the Osaka Hanshin Kyuko Electric Railway Company, which owns the line between Osaka and Kobe, proposes to construct an elevated railway between Osaka and Juso, and also to double the present lines. An underground line projected by the company is from its Kobe terminus to Motomachi.

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CARS WITH INSIDE STAIRCASES AND FRONT EXITS.

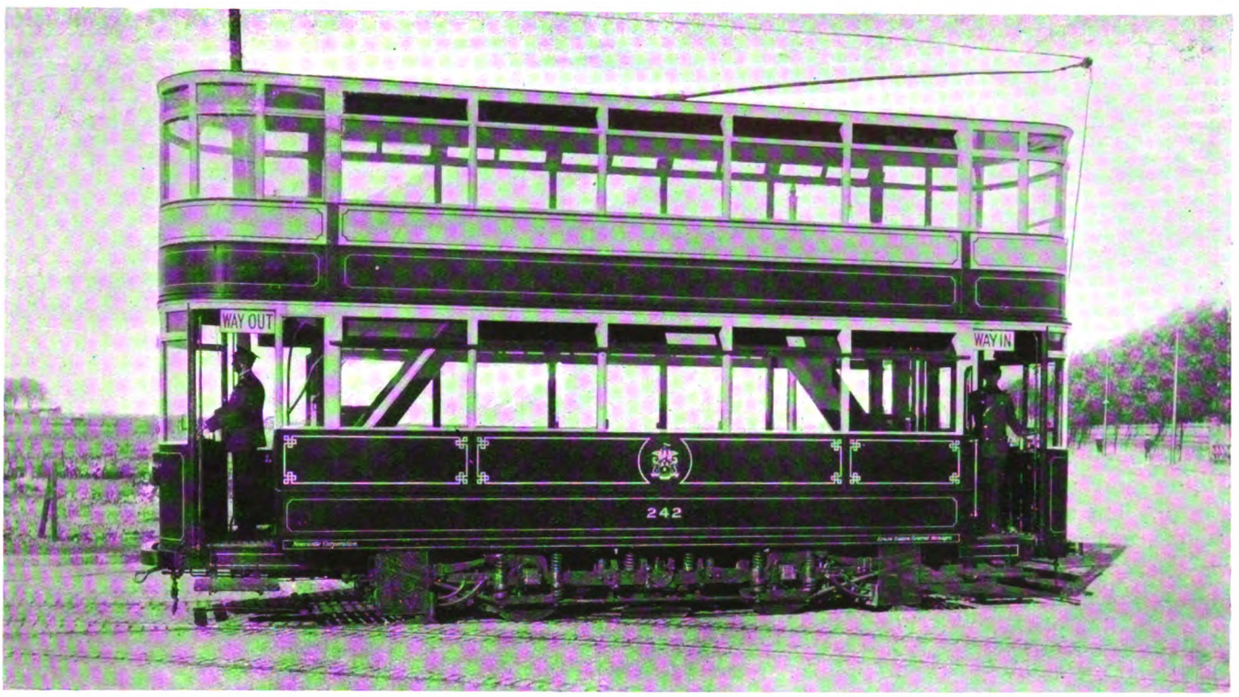
FIFTY-EIGHT NOW IN SERVICE IN NEWCASTLE.

The designers of tramway cars in this country may be classed as the most conservative in their branch of engineering. To this assertion they may aptly reply that it is their business to provide vehicles of a type demanded by the authorities who operate them. Allowing for that contention it still remains true that designers ought not to be backward in endeavouring to secure the acceptance of innovations that would promote economy in operating expenses, besides adding to the convenience and safety of the public. Those attributes may be given to the inside stairway front-exit car without fear of contradiction.

At least, two leading undertakings—Newcastle-on-Tyne and Salford—can be referred to as enthusiastic supporters of this type of car. In America, front-exit cars are, of course, numbered by the hundred. A reminder of their "safety qualities" was given in an article on traffic control in American streets, written by Sir J. Foster Fraser, on the conclusion of a prolonged tour in the States. The best system of car operation, he says, is "where passengers enter by the rear door and leave by the front; and as the front door is controlled by the driver, he knows when all the passengers desiring to leave have alighted."

This system, the author adds, is adopted despite the fact that at principal stopping places there are safety zones close up to where the tramway cars stop, a strip of the road marked off with white painted lines and generally with a protecting chain. When a car stops there is no dangerous running through the traffic to reach it; the passengers are waiting in the safety zone. Comparing this system with British procedure, Sir J. Foster Fraser observes that "it is always a marvel in crowded English streets that there are not more folk killed with people leaving the car and others scampering to it, whilst indignant motor-car drivers are blaring that a way should be made for them." "There is," he says, "a firm rule, applied all over America, that no automobile ever passes a trolley car when it is stationary."

Although motorists will probably not mend their ways or Parliament give English municipalities the power to halt traffic at car-stopping points, as is the case in Glasgow, the front-exit car provides a means of lessening the danger, to say nothing of the economy effected by the abolition of platform accidents. That these considerations are of great value is attested by the rapidly increasing number of front-exit cars with inside staircases to be seen on the Newcastle-on-Tyne Corporation Tramways. When the Newcastle front-exit car was described in our issue for April, 1921, there were forty-two of these vehicles running. Now the number is fifty-eight. Through the courtesy of Mr. Ernest Hatton, the engineer and general manager, we are enabled to give further illustrations showing the construction of cars with inside staircases and front exits. Mr. Hatton's design is the pioneer of this particular type of construction, and he evolved it in the year 1915 to meet the heavy traffic conditions resulting from shipyard activity and munition work due to the war.



Car with Inside Staircases and Front Exits—Newcastle-on-Tyne Corporation Tramways.

A car under construction is shown in two illustrations, which present a very clear view of the commodious platform and the interior staircase leading to the top deck. Other views show the finished car. To appreciate thoroughly the importance of Mr. Hatton's innovation the reader should visit the city and see the cars in service. A visitor's attention will first be attracted by the decreased height of these double-deck cars, many of which were formerly of the single deck type. The lessened height, combined with the cap protection for the motorman, serves to give the vehicle a very attractive appearance.

Apart from this æsthetic consideration, the type has proved of great value as regards safety. Indeed, we

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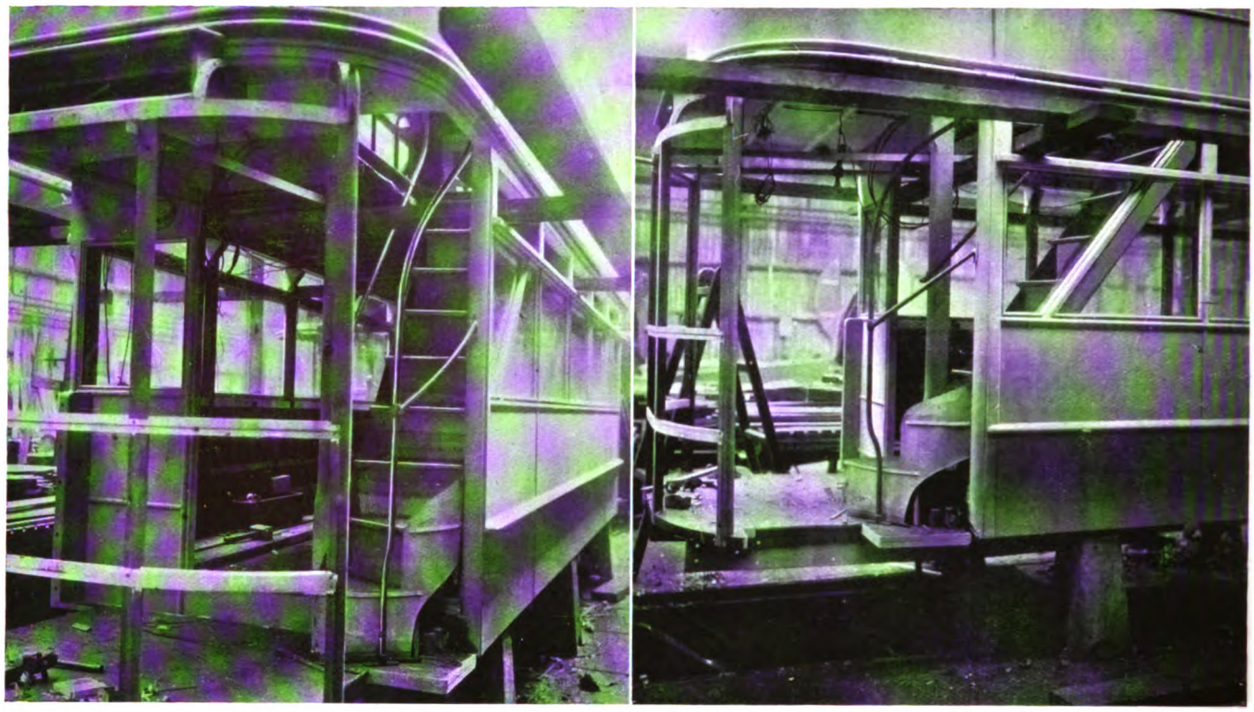
have the authority of Mr. Hatton for stating that accidents to passengers boarding and leaving the platforms have been practically eliminated. A representative of this journal had previously gained similar information by questioning conductors and motormen, who strongly endorse the advantages of the new design.

By taking up at the rear end and discharging them from the front platform there is a great saving of time, and the convenience and safety of the system is much appreciated by passengers. Their comfort is added to by being able to ascend to the upper deck on a staircase which is always dry and clean. With the staircase in



Views of Front Entrance Cars Under Construction, showing Position of Inside Staircase.

The value of this information will be best appreciated by managers reviewing the amount of monetary compensation annually paid for accidents on cars where boarding and alighting both take place from one platform. The safety element of the front exit is due, of course, to passengers alighting under the eye of the

Three-Quarter View of Inside Staircase Car.

driver, consequently it is impossible for a person to descend while the car is in motion. As an additional safeguard there is a rule forbidding the motorman to start before receiving the signal from the conductor. With a car free from a congregation of passengers in the rear, a conductor can discharge his work with ease.

the interior of the car, there is no risk of a passenger falling into the roadway either over the staircase rail or rolling off the platform. Other considerations also tend to the popularity of this type of car. Standing passengers in the lower saloon do not have to press their way back through the car to descend at stopping places, as it is to their interest to get as near to the front platform as possible. This convenience assists in preventing the congestion to be seen in a car that discharges from the rear platform.

Most important of all, there is no congestion of the roadway due to conflicting streams of passengers using only one platform. It is of interest to note that a simple contrivance has been adopted for the purpose of saving passengers from the annoyance of having their feet trodden on at rush periods. It consists of a raised footboard in front of the seats in the lower saloon. The result is that painful incidents in more senses than one no longer " enliven " car travelling in the Tyneside city.

UNDERGROUND GROUP EFFICIENCY MEETINGS.

The first meeting of the seventh session of Efficiency Meetings was held on October 18 at the L.G.O.C. Training School, Milman's Street, Chelsea, Mr. H. E. Blain, C.B.E., assistant managing director, presiding over an attendance of upwards of 400 members of the administrative and control staffs of the allied companies.

A paper on "The Cinema in Transportation" was read by Mr. L. Findlater, superintendent of employment, training and catering, L.G.O.C. The paper showed how the cinema can be employed as an aid to transportation, and also dealt with the origin and development of the cinema. By the courtesy of the Great Western Railway Company, a film depicting the assembly of an express passenger locomotive was shown. The paper also emphasised the usefulness of the cinema as a record of notable and historical events in the transportation world, and as an advertising medium. The L.G.O.C. Hindhead and Rochester Tours were also shown.

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STAINLESS STEEL APPLIED TO TURBINE BLADING.

Rustless steel promises to be of great service to manufacturers and users of machinery, not only because it does not corrode but also because of its great strength. The firm of Thos. Firth and Sons, Limited, Sheffield, have devoted a great deal of attention to the subject, and their careful laboratory experiments have been followed up by trials on the commercial scale. As a result of their pioneer work they are now able to announce that stainless steel has proved itself to possess such remarkable properties that it must be recognised as one of the outstanding contributions of practical metallurgy. The proportion of chromium added to steel to give it the peculiar properties runs up to 14 per cent.

Laboratory experiments may indicate the value of a new metal for a given purpose, but the real proof of such value can only be obtained by a definite trial on an industrial scale. It has for some time been suggested that the chromium steel would be suitable for turbine blades, owing to the fact that it successfully resisted corrosion under similar conditions to those known to exist in a turbine, and, further, that its mechanical properties were not deteriorated by the temperatures attained within the turbine. A practical demonstration of the behaviour of turbine blades made from stainless steel under the conditions of working in the actual turbine has been provided by the opening of a turbine in the power-house of Messrs. Firth and Sons' Tinsley Works, in which several experimental blades have been fitted. A party of technical journalists recently had the opportunity of examining this turbine, with the result that many important facts became available.

The turbine is that of a Westinghouse turbo-generator set of 2,000 KW. capacity, running at 3,000 revolutions per minute. This set was put down in August 1916, and since that time has been in regular use, the average load being 50 per cent. of the full output, fluctuating from full load to about 25 per cent. of that. The steam pressure is 200 lb. per square inch, and the steam temperature, with super-heat, averaged about 600 deg. F. The experimental blades were fitted on June 11, 1920, and alongside the blades of stainless steel there were fitted, for comparison purposes, a number of new blades of the standard type supplied by the makers. These were of 5 per cent. nickel steel. The details of the experimental blades fitted are as follow.

In wheel No. 8, situated at the low pressure end of the turbine, were fitted 12 new blades, three of stainless steel highly polished with three of stainless steel unpolished alongside them. On the opposite side of the same wheel three more of stainless steel unpolished were mounted with three standard blades alongside. These blades are 7 in. long by $\frac{3}{4}$ in. wide, the diameter of the wheel being 4 ft. $1\frac{1}{2}$ in.

In the velocity wheel, situated at the high pressure end of the turbine, were fitted 24 new blades—on one side of the wheel 12 of stainless steel unpolished, and on the opposite side six of stainless steel unpolished with three of stainless steel highly polished and three standard blades alongside. These blades are $\frac{7}{8}$ in. long by $\frac{3}{4}$ in. wide, and the wheel 3 ft. $7\frac{1}{2}$ in. in diameter.

The conditions of the velocity wheel are typical of those with dry steam at a high temperature, and the conditions at wheel No. 8 are typical of very wet steam.

The work done by this generating set since the fitting of the new blades is represented by a run of 3,471 hours, with the demand fluctuating as described above, averaging a 50 per cent. load. The appearance of the blades on opening up the turbine was remarkable. Whilst the standard blades have corroded in the usual way, the stainless ones, both polished and unpolished, are practically untouched, and retain their original brightness. What discoloration has appeared is probably due to rust carried over from the other blades, as shown by the fact that it washes off with a damp rag.

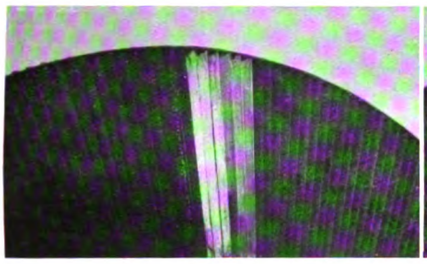

Fig. 1.
Comparison of Polished and Unpolished Stainless Blades after Fifteen Months' Service.

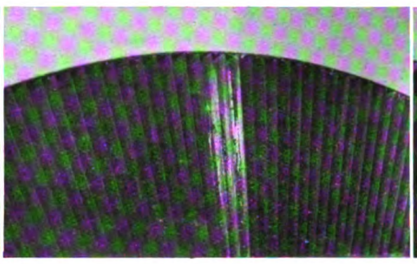

Fig. 2.
Comparison of Three Unpolished Stainless Steel Blades with Three Ordinary Blades.

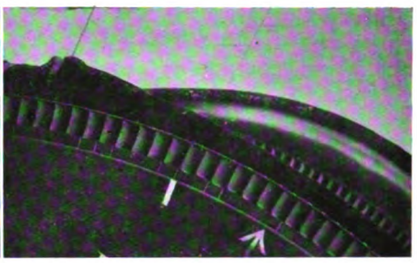

Fig. 3.
Twelve Stainless Steel Blades showing Resistance to Corrosion and Erosion.

Fig. 1 is from a photograph showing three unpolished and three polished stainless blades after fifteen months in service. Fig. 2 shows three of the unpolished stainless blades and three ordinary composition nickel steel put in new into the turbine at the same time as the stainless blades. In Fig. 1 the blades have been rubbed with a damp cloth prior to the taking of the photograph, whilst in Fig. 2 they are as opened out. Fig. 3 shows 12 stainless steel turbine blades as opened out, and the photograph clearly indicates the difference in the response to both corrosion and erosion when comparison is made with the adjoining nickel steel blades.

The stainless steel contained 0·30 per cent. carbon and 13·4 per cent. chromium; whilst the nickel steel contained 0·19 per cent. carbon and 4·71 per cent. nickel.

The mechanical properties of the two steels as placed in the turbine are given in the following table—

	Nickel.	Stainless.
Yield-point, tons sq. inch	25·2	44·1
Maximum stress, tons sq. inch	34·7	54·5
Elongation, per cent.	32·0	20·0
Reduction of Area, per cent.	61·0	59·7
Brinell hardness number	149·	255·

The microstructure of the blades is reproduced in the microphotographs, Figs. 4 and 5, which are both

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at 500 diameters. It will be seen that the nickel steel is in the soft condition, and consists of ferrite holding nickel in solution, with a little pearlite running through it. The stainless steel is seen to consist of fine grained structure resulting from the effect of tempering upon the hardened condition.

It is thus claimed that this experiment gives data sufficient to show that the introduction of stainless steel for use in turbine blading will be of great advantage, and it is quite clear that improved efficiency, due to the retention of a clean, smooth surface on the blades, and the saving of the time and of awkward situations by the avoidance of shutting down for repairs, re-blading, cleaning, etc., will be of direct interest to turbine engineers.

Through the courtesy of Mr. Samuelson, of the British Thomson-Houston Company, we are able also to give the results of another similar experiment performed in connection with one of the British Thomson-Houston turbines. Early in 1916 the Thomson-Houston Company had one wheel bladed with five different kinds of material.

"The blading materials selected were phosphor-bronze, nickel-bronze, brass, mild steel, and stainless

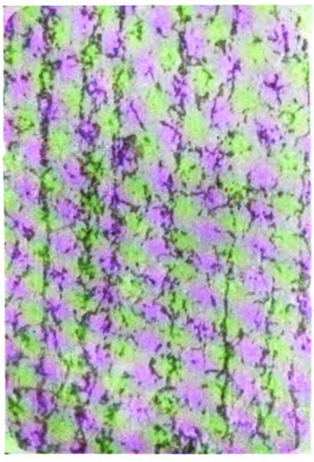

Fig. 4.
Microphotograph of Nickel Blades × 500 Diameters.

Fig. 5.
Microphotograph of Stainless Blade × 500 Diameters.

steel (two of hardened and two hardened and tempered stainless blades were inserted). The machine was put into service in the autumn of 1916, and was opened up for examination for the first time in April 1918. A certain amount of erosion was visible on all trial blades except those made of non-rusting steel. The machine had not been in service sufficiently long to see very clearly the preference of one material over another, except that the brass blades seemed to have suffered most. There were no marks whatever on the stainless steel, whilst the mild steel blade edges were rough; phosphor-bronze and nickel-bronze seemed to have the same resisting quality to the action of the steam and moisture.

"The machine was then closed up and again put into service, and was opened up a second time for examination in July 1921, and the inspection confirms the previous examination, i.e., that the stainless steel blades were in very good condition and absolutely unaffected, the edges being as sharp as when put in, and there was apparently no difference between the hardened and unhardened samples. The phosphor-bronze, nickel-bronze, and brass blades were all roughened at the entrance edge, and very little difference is to be noted between them. The mild steel blades were badly roughened, and the entrance edge was worn away nearly 1-16th of an inch. As far as resisting properties are concerned, the stainless steel is very superior to any other blading material which we have so far tried."

It should be pointed out that, in their experiment, the blades under test were relatively short, and therefore very lightly stressed, and not subjected to any vibration. At the exhaust end of the turbine the blades are stressed highly, and also are more readily subjected to vibration, and it is to be hoped that the stainless steel will show up equally well under these more trying conditions. This point is, however, satisfactorily answered by the mechanical tests given above.

One very interesting experiment which is worth describing was performed by Messrs. Thos. Firth and Sons with a 3-throw electrically-driven hydraulic pump manufactured by Messrs. Davy Brothers, Limited, Sheffield, working at a pressure of 1,800 lb. per square inch, and installed in 1915. One ram was made in stainless steel, the other two being of the standard non-ferrous alloy used by Messrs. Davy Brothers. This pump ran continuously—night and day—until the termination of the war. The wear on the stainless ram has been 1-64th of an inch of the diameter, whilst in the case of the non-ferrous rams it reaches so high a figure as 7-64ths of an inch. The less wear upon the stainless rod means much in saving wear of the packing.

INSTITUTE OF TRANSPORT'S NEW PRESIDENT.

SIR H. P. MAYBURY'S INAUGURAL ADDRESS.

Sir Henry P. Maybury, K.C.M.G., C.B. (Director General of Roads in the Transport Ministry) was installed October 17 as President of the Institute of Transport, at the Institution of Civil Engineers.

In his presidential address, Sir Henry alluded to recent developments in transport, and pointed out that signs were not wanting that in the lower reaches of the Thames great changes might be anticipated. Prudence demanded that careful scrutiny should be devoted to communications, especially road communications, in the triangle between the river and the London-Chelmsford road. The potentialities of the Grays-Tilbury district had hardly yet been probed, and a Thames tunnel at Tilbury connecting Kent and Essex was not a very far-fetched dream. The startling 50 per cent. growth of Southend during the past ten years of leanness was a warning of what might be expected in the plumper years to which they were all looking forward. After referring to probable industrial developments consequent upon the opening of the George V. Dock, he said the deficient access to this dock area was one of the darkest blots on London's traffic map. The density of the traffic on the roads was rapidly reaching such a pitch that there would be soon no space for any form of control other than the ariship patrol, which made its appearance last Derby Day.

Road Maintenance and Railway Activity.

Turning to road maintenance in general, Sir Henry remarked that with the financial assistance which local authorities were now receiving from the National Road Fund, the maintenance of the main roads would, he was confident, be gradually levelled up to a more uniform standard of efficiency. In the legislative changes affecting transport that had marked the past year, one figure, he observed, had stood out pre-eminent—that of the first president of that institute, Sir Eric Geddes, who had skilfully piloted a number of important measures through the baffling cross-currents of Parliament. An era of intense activity was evidently opening in the railway world, where there was a plain determination to provide the public with facilities, conveniences, and attractions from which we had been weaned of recent years. In the great era of reconstruction upon which the world was entering, the development of transport services would play a part second to none, and it was for members of that institute to secure in the forefront of the onward movement an honourable and fitting place for their organisation.

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THE HIGH-VALUE PENNY.

By HARRY ALLCOCK, M.I.E.E., M.I.Mech.E.

At the recent Salford conference of the Municipal Tramways Association several references were made to the proposal that the token value of the penny should be increased and the president paid me the compliment of asking me to speak upon it. As the suggestion is continuing to attract attention in various quarters, the following further particulars are now submitted.

The proposal, in brief, is that the existing penny coin should be declared to represent one-tenth instead of one-twelfth of the shilling, leaving the value of the shilling unaffected and retaining the £ sterling as the British monetary unit. The token value of the penny and its parts would thus be increased by 20 per cent. and the silver coins, while retaining their present values relative to the £, would therefore be exchangeable into fewer coppers (one-sixth less). All existing penny-basis contracts could be brought into exact harmony with the higher value of the penny by deducting one-sixth from the number of pence now charged and in the adjustment of prices expressed in £ s. d. it would only be necessary to alter the odd pence because the values of both the £ and the shilling would remain unchanged.

Any risk of hoarding copper coins in anticipation of their increased token values could be avoided by making the change without notice (as, for instance, in Budget variations of duty), while the Government would not only be saved the present expense of minting additional coppers to compensate for their reduced purchasing power, but could also recover a considerable sum from the holders in bulk of the coppers already in circulation. In this connection it may be observed that the Banks collectively hold copper coins to the value of about one million pounds sterling, and 20 per cent. of that sum would represent a useful asset in these difficult days of anti-waste.

It is important to note that this increased purchasing power of the penny would facilitate the reduction of many retail prices because they cannot now fall below 1½d., as it is obviously impossible to restore the original penny price, and there is no intermediate stage available by reason of the scarcity and unpopularity of farthing coins.

The proposal appears to offer peculiar advantages to the tramway industry, in which the entire revenue is derived from fares based on the penny. Experience has shown that the present practice of charging 1½d. for a pre-war penny fare is objectionable, not only because it involves an increase of 50 per cent., but also because it requires the use of two coins instead of one. Human nature is so constituted that the payment of a single penny is made without thought, but to ask for change involves a financial transaction calling for some consideration on the part of the potential passenger. Even if the passenger overcomes this discouragement, the charge of two coins instead of one involves much giving of change and a loss of nett revenue to the undertaking.

Under existing circumstances tramway managers are thus on the horns of a dilemma, because to retain the existing 1½d. fare must drive more and more traffic away as the man-in-the-street becomes poorer, and to restore the original penny fare must involve continuous losses, because it would not cover the costs of operation, which appear likely to remain permanently higher than before the war. Between these two extremes of 1d. and 1½d. there is to-day no practicable price stage, but if the Government would now adopt the above suggestion to increase the token value of the penny, the desired intermediate fare could be paid by a single penny coin. Such a "penny" fare would not only represent to the passenger an *actual* reduction of 20 per cent., but also an *apparent* reduction of 33⅓ per cent., due to the retention of the old familiar coins. This latter feature indicates that it would be preferable to employ the existing penny to represent a higher token value rather than to introduce a new coin to represent one-tenth of the shilling.

The proposal is peculiarly attractive at the present time since it would promote what our American friends call "normalcy" by bringing about the restoration of a pennyworth for a "penny." On these grounds the high-value penny would be advantageous to the entire community and it is furthermore obvious that, after the penny had been so declared to represent one-tenth of a shilling, every £ s. d. amount could be expressed at sight and without adjustment in £ and decimal parts thereof—a facility of which our export traders would not be slow to avail themselves.

Having regard to the serious loss of traffic now being experienced by so many tramway undertakings it is clear that the existing fares must be reduced and many tramway managers will appreciate that the high-value penny provides the best alternative to a forced return to the original penny fare and the consequent ruin of many undertakings.

FRENCH TRAMWAY AND LIGHT RAILWAY UNION.

LONDON REPRESENTATIVES AT PARIS CONVENTION.

Mr. G. J. Shave, operating manager and chief engineer of the London General Omnibus Company, and Mr. A. V. Mason, deputy general manager and engineer of the London and Suburban Tramway Group, attended the conference of the "Union des Voies Ferrees d'Interet Local and des Transports Publics Automobiles de France," held in Paris on October 20-23. Representatives were present from the more important towns of France, Belgium, Italy, Sweden, and Denmark.

Excellent papers were read on permanent way construction, supply of electrical energy, electrolysis, the electric trolley omnibus, and the economical position of surface transport generally. It is interesting to note that Mr. Shave was selected to preside over one of the meetings. One of the more important matters arising out of the gatherings was the suggestion that the various operating concerns in this country should be officially represented by their Associations at these conferences, so that the matters of technique and standards could be discussed and settled internationally.

The various representatives were presented to the Commissaire of Paris at the Hotel de Ville, and attended a banquet at the Palais d'Orsay, at which the French Minister of Transport presided. Visits were made to various important omnibus and tramcar repair shops.

Messrs. Shave and Mason were received with the greatest hospitality, and found the papers and discussions both interesting and important.

Sir Robert Peacock (chief constable of Manchester) and Messrs. Johnson and Crooks (chairman and deputy chairman of the Manchester Police Committee), representing the Lord Mayor, were also present at the convention.

Electric Railway Construction in Norway.—Information has been received in the Department of Overseas Trade from the Commercial Secretary to H.M. Legation at Christiania that the Norwegian Storthing has granted a concession to "A/S Akersbanerne" for the construction of an electric railway from the centre of Christiania to Ostensjo, a distance of about eight kilometres. The Commercial Secretary states that the work on this line will probably be commenced simultaneously with the construction of the Majorsteum-Sognsvander railway, a concession for which was also granted recently.

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THE EDITOR will be glad to consider articles by experts. All information of a practical character relating particularly to the engineering and operating branches of transportation will receive prompt attention. Original illustrations will also be welcome.

LONDON, NOVEMBER 17, 1921.

The State Loans Scheme.

Electrical undertakings of various kinds will no doubt come in for a large share of the 25 million pounds set apart by the Government for encouraging schemes creative of employment. If speeches of the Chancellor of the Exchequer count for anything, tramways and light railways should receive consideration at the hands of the independent committee to be set up to allocate the money. Speaking at a dinner of the Trades House of Glasgow, on October 12, Sir Robert Horne, in a reference to the Trade Facilities Bill, remarked that the work for which loans were to be granted should be revenue-producing, and should in its turn produce more work, such as the development of tramway and light railway undertakings. Explaining the provisions of the Bill in the House of Commons on October 25, the Chancellor again referred to tramways and light railways as an example of the domestic enterprises suitable to receive aid, and he also mentioned electric undertakings. As enterprises coming under these categories will not only be revenue-producing but will create a great deal of work in the manufacture of materials, there will be no lack of applications. It is satisfactory to note that a deputation from the Joint Industrial Councils of the electrical engineering industry on November 3 placed before Sir A. Mond, as chairman of the Cabinet Committee on Unemployment, a memorandum of proposals for increasing work, including development of electric light and power undertakings, and the electrification of railways. The action of the deputation is a commendable example of co-operation between employers and employees, and it should add weight to the individual applications when submitted to the committee of experts. Judging by the number of requests which had been sent direct to the Prime Minister up to the end of the first week in November, the Committee will have a heavy task in arriving at their decisions. The schemes submitted more than absorbed the amount which Parliament had authorised for allocation. The money would, of course, go farthest by devoting the greater part to guaranteeing the payment of interest, but doubtless there will be many projects for which it will be desirable to guarantee payment of principal. It is to be hoped that participants will not regard the aid in the nature of a bounty. A real attempt should be made to render the work self-supporting, and that cannot be done unless wages and fuel are obtainable a economic rates.

Ministry of Transport.

To abolish the Ministry of Transport would, we are convinced, be "economy run mad." Viscount Peel has been appointed without salary to act in the place of Sir E. Geddes, but this appointment seems to have been made temporarily in consequence of the necessity of a titular head until the fate of the Ministry is decided. That decision will not be reached until the ex-Minister has presented to the Premier his recommendations on the future of the Ministry. No man is more fitted to advise on that point, and it is improbable that he will advise that the Ministry should become a department of the Board of Trade. Upon its formation the Ministry took over from that Board all work connected with railways, tramways, canals, inland navigation, harbours, docks, piers, electricity supply, etc. To these activities roads and mechanical road vehicles were added by removing their supervision from the Local Government Board and placing them under a director of roads responsible to the

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Minister of Transport. Apart from a few newspapers there has been no serious opposition to the existence of the Ministry, and the vehemence of the former should be discounted as zeal in pushing the anti-waste movement. The country owes much to the eminent former railway officials who, with the Minister, arranged the settlement of war liabilities with the railway companies, and co-operated with the companies in bringing about the mergers instituted for securing economical working. On the part of the railway, dock and canal companies there has been no complaint of the work done at Whitehall. As for tramway organisations, they have found the existence of the Ministry to be of great assistance and convenience. Motorists —a section of them—have offered considerable criticism, but their complaint would be removed if their cars were not taxed according to horse-power, a duty being placed on petrol instead. Local authorities, it is true, complain of the high cost of the reconstruction and maintenance of roads, but that is not the fault of the Ministry's road department. Electricity undertakers are not objecting to the work of the Electricity Commissioners, who are working on economic lines adapted to the times by advancing schemes for linking up rather than securing super stations. In the House of Commons, opposition has been voiced by not more than a couple of members entitled to be regarded as experts. Labour has to be credited with a wholehearted support of the Ministry, and it would be difficult to state a more thorough case for the continuance of the Ministry than that contained in the joint letter to the Prime Minister from the Trade Unions Congress, the National Executive of the Labour Party, and the Parliamentary Labour Party.

Medical Re-Examination.

Reports of inquests held on a motorman and an omnibus driver in London emphasise the necessity of instituting a periodical examination of the fitness of drivers of public service vehicles. In discussions on the subject at a conference of the Municipal Tramways Association, following a paper presented by the eminent medical authority then conducting the examination of the London County Council's employees, considerable support was given to the proposal that there should be an annual examination. At present there appears to be no undertaking where so stringent a regulation prevails, but a number of cases were mentioned where it is customary for motormen and conductors to undergo a scrutiny by the medical officer before being permitted to resume duty after an illness. Now that there are many employees who may have suffered in health through war service the need for re-examination is undoubtedly greater, both in the interest of the men themselves and of the public. The evidence at the inquiry into the death of the omnibus driver lends importance to that contention, for it was stated that the man was injured in France and his heart was affected. He was found dead at the side of his omnibus after he had manipulated the starting handle, and the doctor's testimony was that the exertion probably aggravated his condition. In the case of the motorman his medical attendant stated that death was due to syncopy from heart disease, accelerated by shock from the injuries he had received through his car running into a lorry. No attempt had been made by the deceased to apply the brakes, and when questioned after the accident he stated that a mist came before his eyes, and he remembered nothing more until he was taken from the platform. The doctor made the disquieting revelation that he had attended the deceased for diabetes, which disease would on occasions affect the eyesight and also cause heart attacks. That the doctor recognised that the man was not fit to follow his occupation was shown by his further statement that he had advised him to give it up, not only for his own sake but also for that of public safety. For the latter reason we would urge that before employees are permitted to resume duty their certificates from medical attendants should fully disclose the cause of their illness. The adoption of this course would be facilitated if employees are assured that other work, if available, will be found for them if they are not fit to be reinstated in their old positions. The importance of the whole question has been greatly increased by the universal employment of motor vehicles. Tramway motormen's duties have been rendered more arduous, and there is greater necessity for thorough fitness and physical reliability.

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Railway Electrification Prospects.

Interest in railway electrification schemes has been revived during the past few weeks, because there is at present a prospect that some of them at least may soon be carried out. The stimulating factor is the possibility of a State guarantee of capital and interest on loans raised for the purpose of carrying out the work. This is provided for in the Trade Facilities Bill which has been passed by Parliament, the primary object being to give work to the unemployed. By the aid of the guarantee railway companies would, of course, be able to secure subscription to debenture stock at a lower rate of interest than would otherwise be the case. But even so, the cost of construction and equipment at present prices is such that the annual capital charges must be very heavy. A desire to help the unemployed and to benefit the travelling public would seem to be the main reasons for proceeding with the work now, rather than some years hence when it may be presumed financial conditions will be much easier. However that may be, several railway companies already possessing Parliamentary powers for the purpose may go ahead before very long. The interesting scheme of the London underground railway companies for extensions, connecting lines, and widening of the tunnels of the City and South London Railway has had a set-back because the Government will not accede to the companies' suggestion to promote legislation to give the London General Omnibus Company a monopoly in omnibus traffic in London for ten years. That proposal was put forward so that the omnibus company might be the better able to help to meet the new capital charges on the associated railways. The proposal seemed reasonable enough, as all necessary safeguards would be provided, but it aroused much opposition. A new scheme is promised. Another case in which the preliminaries have been carried out, so that work might begin almost immediately is the further electrification of the Brighton Railway. Negotiations with the Government have been going on with respect to that. There are other authorised electrifications in regard to which nothing new has emerged, but the situation has resulted in the publication of particulars of a large and interesting proposal for the conversion of the suburban lines of the South Eastern and Chatham Railway. From the point of view of the public, employed and unemployed, as well as that of the electrical and steel industries, it is to be hoped that some of the proposed work will be speedily put in hand.

ELECTRIFICATION AND UNEMPLOYMENT.

The Allocation Committee will not have to think twice to grasp the revenue producing merits of electrical engineering work. Those benefits are convincingly set forth in a leading article, entitled "Reflections on Unemployment," printed in the October issue of the *English Electric Journal*. Evidently it was written before the announcement of the result of the deliberations of the Cabinet, for its concluding sentence reads thus—"If the Government would trust the great industries by facilitating the financing of productive schemes, a large number of men could be found employment at their own trades, instead of being left to the slow demoralisation of the dole or useless relief work."

"It is not always realised," says the writer, "what the loss to the nation through ordinary relief work is. Take a man earning £4 a week in an engineering shop and transferred through lack of employment to relief work at the same wage. His normal employer has a clear loss, in unabsorbed establishment charges, of £5 a week, on the moderate basis of establishment charges of 125 per cent. on labour. On relief work a good tradesman is inefficient and uninterested, and of the £4 a week which he is paid, probably not more than £1 on the average has any permanent value. There is, therefore, a loss to the nation of £8 a week through this one man being turned adrift from his normal employment. An electric power station, on the other hand, or the electrification of a railway absorbs an enormous amount of direct labour per £ expended, and it is an important addition to the wealth and the wealth-producing capacity of the country. An examination of an actual railway electrification scheme, which would cost £6,000,000 and could not fail to produce a very high return on the money spent, shows that when every allowance is made for certain imported materials, such as copper, £4,800,000 out of the total capital cost of six millions would be spent on direct labour in this country. Nearly all the great railway companies have schemes for electrification worked out or in contemplation, but it is unreasonable to expect that the large sums of money required can be raised unless the status of this new money in relation to the present capital of the railways is safeguarded." To the foregoing quotation we have only to add that railway electrification means a tremendous conservation of fuel, apart from its many other advantages.

REFUSAL OF MOTOR COACH LICENCES.

TRANSPORT MINISTRY APPROVE BLACKBURN COUNCIL'S ACTION.

On the recommendation of the Watch Committee, the Blackburn Corporation recently refused to licence coaches to ply for hire. The town clerk has since reported that the Minister of Transport was satisfied that the Watch Committee had properly exercised the discretion vested in the committee by the Town Police Clauses Act, 1889, and that the Minister had accordingly disallowed the appeal of the firm. In the matter of an application by a firm of omnibus proprietors for a licence to ply for hire in connection with a service to be run between Blackburn, Guide, and Belthorn, the Watch Committee have granted the request on condition that the service is terminated on six months' notice being given by the Corporation.

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CORRESPONDENCE.

"SCRAP THE TRAMCAR."

To the Editor of "THE TRAMWAY AND RAILWAY WORLD."

Sir,—I have read with interest the letter from the director of Leyland Motors, Limited, which appears in your current impression. One would almost have thought that the proper place for this letter would have been in your advertisement columns; but at any rate I think that some of the statements made in it should not go unchallenged. The apparent object of the letter is to persuade ratepayers to induce their representatives on their Councils to scrap their tramway undertakings, and buy petrol omnibuses of a make that shall be nameless.

. I think it is quite clear that the writer could not have gone very deeply into this matter from any other but a petrol omnibus point of view. For instance, the financial aspect of the question does not appear to have received much of his attention, and he would seem to be ignorant of the fact that if our tramway systems were scrapped the ratepayers would still have the burden of their interest and sinking fund to meet as a direct charge on the rates.

His reference also to railless traction does not seem to show much acquaintance with the facts. He states that the total cost of running petrol omnibuses and trolley omnibuses are about the same, but I think it must be acknowledged that Mr. Wilkinson, of Bradford Tramways, can be relied upon as one who does know something about railless traction; and he has on more than one occasion stated that railless omnibuses are cheaper than petrol omnibuses by 4d. to 6d. per car-mile, the chief reason, of course, being that the maintenance of the electric vehicle, with its few moving parts, is far less than that of the complicated machinery of the petrol omnibus.

The writer also says that the earning capacity of a petrol omnibus is vastly greater because the line of route can be changed from day to day to suit local traffic conditions. I have yet to learn that it is a profitable venture to dodge omnibuses about different streets from day to day.

He also states that the petrol omnibus by coming to the footpath to pick up its passengers is a great convenience to the public, etc., and this alone would point to the fact that the writer has never seen a railless car, otherwise he would have known that it also comes to the footpath to pick up its passengers. His statement also regarding speed, mobility, and convenience show equal unmerited bias towards the petrol vehicle.

His remarks about the extension of generating plant are quite beside the question, and have no bearing whatever.

One is almost tempted to think that the reason the letter was written was the fact that the great strides that are now being made all over the country in railless traction has "put the wind" up the petrol omnibus people, but in spite of this it is quite evident that far from the opinion expressed that a general adoption of trolley omnibuses would be a retrograde step, the contrary is the fact.

Yours faithfully,
L. E. HARVEY
Tramways Manager and Engineer.
Tramways Department
Ley Street, Ilford, Essex,
October 28, 1921.

THE TROLLEY OMNIBUS.

To the Editor of "THE TRAMWAY AND RAILWAY WORLD."

Sir,—With reference to the letter under the heading of "Scrap the Tramcar," and signed by Mr. C. B. Nixon, director of Messrs. The Leyland Motors, Limited, which appeared in your issue of the 20th inst., it would be extremely difficult for Mr. Nixon to convince, say, the Tees-Side Railless Traction Board, who are at present operating trolley omnibuses at 1·11d. per omnibus-mile for electric power, and purchasing current at three farthings per unit, that it would be to their advantage to substitute petrol-driven omnibuses at a cost of 6d. to 7d. per omnibus-mile in petrol and lubricating oil.

Where there is cheap electric power available, recognised routes to be dealt with, and a service of from 2½ to 30 minutes to be catered for, there is no vehicle that can approach the trolley omnibus from an economical standpoint. The tramcar is still justified for services of 2½ minutes, and more frequent, owing to its large seating capacity.

Tramcars with trailers are now in service which accommodate over 120 passengers, which is very much in excess of the seating capacity of the latest design of petrol omnibus.

In districts without a cheap electric supply, or having a cheap electric supply with a less frequent service than 30 minutes, the petrol-driven vehicle ranks supreme. This is purely a commercial problem, and it requires but a simple calculation to discover which vehicle—the tramcar, the trolley omnibus, or the petrol omnibus—can be operated to the best advantage under varying conditions. Taking the present cost of double tram paved track at £40,000 per route mile, and giving same a life of twenty years, the cost figures out at 3d. per car-mile for a 2½ minutes' service in interest on capital outlay and sinking fund charges. Over and above these charges a tramcar with trailer having a capacity for 120 passengers can be operated at a considerable saving on two petrol omnibuses each seating 50 passengers.

In a similar manner the maintenance, interest, and sinking fund charges on the overhead equipment of a trolley omnibus system cost one penny per trolley omnibus-mile for a 7½ minutes' service. The current at an average cost of 1d. per unit costs 1¼d. per omnibus-mile, making 2¼d. in all, as against, say, sixpence per omnibus-mile for petrol and lubricating oil for the petrol-driven vehicle.

Let us employ the most suitable vehicle, whether it be the petrol omnibus, trolley omnibus, or tramcar; they each have their economic sphere.

Yours faithfully,
For CLOUGH, SMITH AND COMPANY, LIMITED,
N. CLOUGH, director.
36, VICTORIA STREET, WESTMINSTER, S.W.

Authority for Railless Traction Schemes.—In the House of Commons on October 31, Viscount Curzon asked the Minister of Transport whether he had received applications from local authorities in the country for power to run systems of electric railless traction along public roads; whether the operation of such systems could not be undertaken without specific Parliamentary authority, which could not be obtained until next August; and whether, having regard to the necessity for creating immediate employment arrangements could be made at once, after due inquiry, to sanction in proper cases the construction and operation of any such system? Mr. Neal: I am aware that certain local authorities are considering the desirability of substituting a system of railless electric vehicles for sections of their tramways. Power to give the sanction in the manner suggested would require general legislation.

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LORRY OBSTRUCTION APPEAL.

The King's Bench Division, presided over by the Lord Chief Justice, heard an appeal by the driver of a tractor, to which a loaded trailer was attached, against a conviction and fine of 40s. and costs for obstructing the driver of a car who desired to pass in the direction of Altrincham, on the main road between Chester and Manchester. It was alleged that although the car driver frequently sounded a horn, the defendant kept to the best part of the road for nearly half a mile.

In delivering judgment the Lord Chief Justice said that the lorry driver laid himself open to conviction by the mere fact of travelling for half a mile without giving an opportunity for vehicles overtaking him to pass. He knew perfectly well that owing to the oncoming traffic it would be difficult, possibly dangerous, for overtaking vehicles to pass him on his offside while he kept the crown of the road. Lorries obstructed a large area of the road, and to allow a free passage for overtaking vehicles they must keep to the left. They need not necessarily hug the kerb the whole distance, but they must not go for considerable distances without giving an opportunity to cars which happened to be behind them. Adverting to the defence that the tractor driver did not hear the horn, his Lordship observed that a horn was no good for lorry drivers; they wanted a big gun to make them hear and get out of the way.

LORRY AS HACKNEY CARRIAGE.

MINISTRY OF TRANSPORT'S TEST CASE.

At the instance of the Ministry of Transport, the Norfolk County Council, on October 14, at East Dereham, summoned Messrs Wright and Sons for using a motor lorry as a hackney carriage, when it had only been licensed to be used solely for another purpose.

The case for the prosecution was that defendants paid a licence duty of £33, which entitled them to use the lorry as a private car or a trade vehicle, and also as a hackney carriage, provided it did not carry more than 14 passengers. Evidence was given that the lorry was let for hire on several occasions, and had carried 32 passengers, and that it thus became a hackney carriage, the licence for which was £60.

The defence was that the lorry was not a hackney carriage, because it did not stand or ply for hire, and was not let for hire, the owners merely contracting to carry parties to and from a certain place, and retained the sole control of the vehicle. The schedule of the Finance Act imposing duties on hackney carriages only applied to vehicles which are primarily and mainly used as such. There was no offence under the Roads Act, because the section only referred to licences for vehicles to be used solely for a certain purpose.

The Bench, by a majority, decided that the lorry was not a hackney carriage within the meaning of the Act. The Ministry of Transport are taking the case to a higher court.

TRAMWAY WAGE REDUCTION.—Wage reductions, based on the latest index figure of 110, took effect on the first full pay period in November, and applies to all tramway authorities who have given full effect to the Industrial Council's decisions. The reductions are as follows—Employees aged 18 and over by a further 2s. per week, making a total reduction of 5s. per week; under 18, by a further 1s., making a total reduction of 2s. 6d. per week.

PROPOSED INCREASE OF FARES AT WOLVERHAMPTON. — An application has been made by the Corporation to the Tramway Charges Advisory Committee for power to increase fares under the Tramways Temporary Increase of Charges Act, 1920. It is desired to increase the ordinary fares, in the same relation, to the minimum of 2d., which the Corporation have a right to charge under their present Act. Increased fares under an Interim Order came into force on July 26 last.

ANNUAL DINNER OF THE B.E.A.M.A.—The British Electrical and Allied Manufacturers' Association held their annual dinner at the Savoy Hotel on October 20. Lord Ampthill presided, and there was a large attendance. Mr. George Balfour, M.P., in proposing the toast of "The Industry," said that in spite of the threatened increase of foreign competition through the establishment of agencies and works throughout the country, he was satisfied that they would overcome all difficulties if they were given a reasonable chance. Replying to the toast of "Our Guests," Sir H. W. Thornton asserted that the railway world had no quarrel with the present state of wages, provided that they received production from every man corresponding to the payment he received. There was no responsible railway manager who did not admit that before the wheels of industry could be made to revolve, rates and fares must come down.

TRAMWAY AXLES.

BRITISH STANDARD SPECIFICATION ISSUED.

The British Engineering Standards Association have issued a British Standard Specification for Tramway Axles (Report No. 102, 1921). The specification should prove of value both to manufacturers and tramway undertakings, following closely the lines of the revised "Standard Specification for Railway Carriage and Wagon Axles" (with analysis), which is included in Part I. of the new edition of Report No. 24. A percentage of ·05 of phosphorus or sulphur is permitted in the steel as in the case of the railway axle specification, but for the manufacture of tramway axles no particular process of steel-making is specified. Falling weight, tensile and cold bend tests are required, the latter being for use only where the order is for a number of axles under fifteen, when it is to take the place of the falling weight test. A diagram is included illustrating the method of performing the cold bend test. Normalising (of which a definition is given) or oil-treating is specified, the choice to lie with the purchaser.

The specification may be obtained from the offices of the Association, 28 Victoria Street, S.W.1, or from Crosby, Lockwood and Son, Stationers' Hall Court, E.C.4, price 1s. 2d., post free.

HIGHWAYS ACCOUNTS.

"A Practical Costing System applied to Highways Administration," by Mr. J. W. Blakeborough, accountant, Tramways and Highways Department, City of Leeds, which has been published by Jowett and Sowry, Limited, of that city, at 3s. net, will be received by highway officials throughout the country as a very opportune and useful contribution to their office literature. They will soon become familiar with the special forms, completion of which the Ministry of Transport require before making grants towards roads maintenance, but in order to furnish the statistical and financial information called for, it is expected that more elaborate and exact methods of costing will be found necessary in many highways departments. Mr. Blakeborough's book, whose thirty odd pages are well printed and not overburdened with detail, deals with every factor in the calculation of costs of road maintenance, and also contains a section on stock accounting, etc. The author notes in his preface that the system he describes was installed in the Leeds Corporation Highways Department in 1914, upon the initiative of Mr. J. B. Hamilton, the city's commercial manager.

RELIEF WORKS ON BIRMINGHAM TRAMWAYS.

The General Purposes Committee of Birmingham City Council recently adopted schemes of municipal work, involving an expenditure of £250,000, with a view to relieving the unemployed. The various committees had submitted schemes. The Tramways Committee reported that they were willing to undertake tramway reconstruction works at a cost of £319,000, provided a grant in aid is received equal to 60 per cent. of the labour. If this is approved, says the *Birmingham Post*, it will be necessary for special financial arrangements to be made by the Finance Committee, as no part of the cost of the work can be borne by this year's trading. The General Purposes Committee recommended that the Tramways Committee be authorised to proceed with the work on the understanding that £100,000 will be the limit of expenditure to be met by the department up to the end of December. Assuming that £60,000 of this £100,000 is for labour, and will rank for a 60 per cent. grant from Lord St. David's Committee, the Tramways Committee would be enabled to carry out works to a total value of £136,000 by the end of the year.

DUNEDIN (N.Z.) TRAMWAYS.—Mr. W. H. Mackenzie, manager of the Dunedin Corporation tramways, in his annual report, states that the revenue amounted to £115,865, and the profit to £9,022. The revenue is greater, but the profit £5,000 less than the preceding year. The passengers carried totalled 18,744,010.

MIRRORS FOR HEAVY VEHICLES.—The Edinburgh Division of the Motor Trade Association urge that in view of the great increase in the number of heavy delivery vehicles and coaches now on the roads, and the fact that such vehicles are regularly met with on narrow roads it was urgently necessary that a regulation be enacted requiring such vehicles to carry a mirror to reflect overtaking vehicles. The Secretary was instructed to send a copy of the resolution to the headquarters of the Motor Trade Association.

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NEWCASTLE TRAMWAYS YEAR.

The annual report on the working of Newcastle-upon-Tyne Corporation Tramways for the year ended March 31, 1921, has been issued by the engineer and general manager (Mr. Ernest Hatton). He states that the West Moor and Forest Hall lines were completed in the period under review. The committee's scheme for the revision of fares, to meet increased expenditure in wages and materials, fulfilled all anticipations in respect of the estimated additional income of £80,000. Unfortunately, however, the increased cost under the headings mentioned outstripped the augmented revenue, and it was only at the end of the financial year that any relief was experienced owing to falling prices of materials. Wages, however, remained at the high standard they had attained throughout the year. Mr. Hatton directs attention to the heavy item " Local Rates," amounting to £25,614, equivalent to a penny per car-mile, and also to the £17,789 called for by Income Tax. Notice is also taken of the considerable expenditure during the year out of the reserve and renewals fund, largely for work which could not be dealt with during the war. The balance in this fund is now £66,218 and the manager points out that the necessary resuscitation of the fund can only be achieved by a reduction of working expenses, as the limit of receipts, with present fares, has been reached.

In the overhauling and repair of rolling stock and permanent way, much progress has been made. The accommodation at the Byker Car Works is now totally inadequate, and proposals have been placed before the Transport Committee for extensions to the car sheds and for better workshop facilities. Some comparative figures extracted from the financial report are appended—

	1920-21.	1919-20.	1918-19.
	£	£	£
Traffic Revenue	565,692	479,214	451,162
Other Revenue	14,576	10,707	9,808
	580,268	489,922	460,971
Working Expenses—			
Traffic expenses	273,607	225,826	172,338
General expenses	44,191	31,629	25,106
General repairs and maintenance	113,089	94,631	66,158
Power expenses	50,108	37,779	27,782
Repairs in power and sub-stations	8,556	9,197	6,326
Energy for Newburn trams	1,158	1,199	1,141
Public lighting expenses	8,254	7,820	7,635
	498,966	408,084	306,490
Balance, being gross profit	81,302	81,837	154,480
Add Interest on investments, etc.	7,829	9,277	6,950
Sum available	89,131	91,115	161,430
Less Special rents, etc.	2,360	2,126	2,606
Interest on capital	21,813	21,335	22,856
Redemption of debt	41,660	41,781	40,613
Interest on old horse tramway loans	1,470	1,374	1,384
Allowances to dependents of service-men	—	—	13,178
	67,305	66,616	80,640
Balance	21,826	24,498	80,790
Appropriated as follows—			
Income tax	17,789	23,095	20,427
Contribution in relief of rates	—	—	14,000
Insurance (3rd party) reserve	—	—	1,363
Reserve and Renewals Fund	4,037	1,403	45,000
Amount spent during year out of Reserve and Renewals Fund	90,796	16,466	7,397
Balance left in Reserve and Renewals Fund at date	66,218	166,976	192,853

FINANCIAL REPORTS AND MEETINGS.

Babcock and Wilcox, Limited.—An interim dividend of 7 per cent., tax free, has been announced.

General Electric (U.S.A.) Company have declared a dividend of 2 dollors per share on the capital stock.

Madras Electric Tramways.—An interim dividend has been declared at the rate of 6 per cent. per annum.

Callenders' Cable and Construction Company, Limited.—An interim dividend of 1s. per share, less tax, has been declared.

Traction Power Securities, Limited.—A dividend has been announced of 3s. 6d. per share, less tax, on the ordinary shares.

Rangoon Electric Tramways and Supply Company.—An interim dividend of 8 annas per share on the ordinary shares has been announced.

Marshall, Sons and Company, engineers and brassfounders, of Gainsborough, have decided, in view of the continued trade depression, to pass their interim dividend.

City of Buenos Aires Tramways Company.—A dividend of 1s. 3d. per share, being at the rate of 5 per cent. per annum, has been declared for three months ending September 30 last.

Calcutta Tramways Company have passed the interim dividend. It is understood that the directors feel some uncertainty in regard to the results for the year owing to the large increases in salaries and wages that have been granted.

Hurst, Nelson & Company, Limited, made a profit for the year ended July 16, of £94,229 (after allowing for taxes, directors' fees, etc.), as against £103,544 in the previous year, and £74,034 during 1918-19. A dividend of 20 per cent., free of tax, has been recommended. The general reserve will now stand at £70,000.

Aberdeen Suburban Tramways Company.—For the half-year ended July 31, the profits amounted to £1,771, and with £3,808 brought in, there is a sum available of £5,579. The directors propose to place £1,000 to the renewal and depreciation account, bringing it up to £22,300, and a distribution at the rate of 7 per cent. for the year was approved at the meeting, carrying forward £2,292.

Cardiff Omnibus Services.—At a meeting of Cardiff Tramways Committee on October 14 the City Treasurer (Mr. John Allcock) submitted a financial statement regarding the motor omnibuses for the nine months ended September 30. The revenue account showed a loss of £1,238, which, with loan charges, brought the total loss during the nine months to £2,746, or 5·63d. per car-mile. The tramways manager (Mr. R. L. Horsfield) said the future success of the omnibuses depended upon working outside the city boundaries. The chairman (Councillor S. Jenkins) believed the chief cause of the loss was the depression in trade, as shown by the decreased income from the tramcars.

Bradford Tramways' Half Year.—The receipts of Bradford City Tramways for the past half year show a notable improvement, especially in view of the trade depression and the coal strike. Increased fares, it may be recalled, were brought into force on October 1 last year. The following are comparative figures showing the receipts during the past half year with those of the corresponding period of last year—

	1921.	1920.	Increase.
	£	£	£
Tramway receipts	331,208	308,042	23,166
Railless receipts	10,804	9,985	819
Parcels receipts	8,698	8,257	441
Miscellaneous receipts	4,589	3,712	877
Total	355,299	329,996	25,303

Trafford Park Company (Tramways).—It was reported at the annual meeting held in Manchester on October 13 that the net profit for the year amounted to £67,581, an increase of £11,581 over last year, and an increase of £31,119 over 1919. The balance standing to the credit of the profit and loss account now amounted to £187,603, after providing £10,900 for Corporation Profits Tax. Out of this sum it was proposed to pay a dividend of 8 per cent., leaving an amount to carry forward of £135,603. Mr. Marshall Stevens, M.P., who presided, said there was a disposition at present amongst tramway authorities to avoid further expenditure upon permanent way, and it might be that, under any new arrangement, the overhead electric wires would be utilised for railless trolley vehicles in addition to, or entirely to replace, the tramcars. If it were found necessary for the statutory company to make an application to Parliament and a friendly arrangement could be come to with the Eccles Corporation and the Davyhulme authority it might be decided to join Trafford Park and Patricroft by a railless car service.

Norwich Electric Tramways Company.—At the twenty-fifth annual meeting on October 28, the chairman, Mr. Francis Fitzgerald, C.B.E., after referring with deep regret to the death of Mr. Reginald J. West, a former director, said the net profits for the year were £3,933, the poorest return the company had obtained since 1908. Larger expenditure had been required for stores and materials, in view of the amount of repair work necessary. The renewal of the track was interrupted by the non-delivery of rails and other supplies for which orders had been placed. All other items of expenditure, particularly rates, insurance and income tax, showed considerable increase. For the future they might look to a lowering of expenses per car-mile, which would enable a better result to be obtained. The total receipts had been increased by £7,380, which, although comparing badly with 1920, was a greater increase than in any previous year. A new scale of fares was put into force in November, 1920, and to the extra halfpenny was ascribed the increase in receipts. They had been fortunate in securing as general manager Mr. C. T. Jewell, late of the Yorkshire (West Riding) Tramways Company, and everything that skilful management could do was being done to secure the best operation, and to ensure proper maintenance of the equipment. On behalf of the board the chairman expressed his thanks to the general manager, the staff and employees. The report was adopted unanimously, and the net profit passed to the reserve account.

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TRAMWAY AND LIGHT RAILWAY NOTES

BELFAST.

A Big Undertaking—Cost of Cars—Proposed New Route.

Track reconstruction is proceeding satisfactorily but under somewhat difficult conditions. Many ex-service men are employed on the work, and in consequence of disturbances due to so-called political causes, detachments of troops are protecting the workers at certain points. The reconstruction work will be spread over a period of about two years, and will involve an expenditure of over 400,000. At a recent meeting of the Tramways Committee the general manager (Mr. J. S. D. Moffet) reported that the delivery of 50 of the new cars had been completed. Owing to the increased cost of materials and labour as provided for in the contracts, the cost of the cars will be about £154,000, as compared with the original contract price of £128,870. The Council have now authorised an application to the Ministry of Transport for sanction to a loan of £15,000 to make up the sum required. It has been decided that the suggestion for the construction of a tramway along the Dufferin Road for the accommodation of workers and others at the North Yard should be taken into consideration when the proposals for further extensions are next discussed.

BEXLEY.

Tramway Strike Ends.

The strike of tramway employees of the Urban Council, which commenced on October 5, ended on Friday, October 7, when the car service was resumed. The strike originated as a protest against the dismissal of a timekeeper.

BIRKENHEAD.

Track Reconstruction.

The reconstruction and renewal of the tramway track at a cost of £99,500 is one of the features of the scheme adopted by the Corporation for the relief of the unemployed.

BIRMINGHAM.

Relief Works—Termini Improvements—Effect of the Coal Strike.

The General Purposes Committee of the City Council have adopted schemes of municipal work involving an expenditure of £250,000 with a view to relieving the unemployed. The Tramways Committee have announced their willingness to undertake tramway reconstruction works at a cost of £319,000 provided a grant in aid is received equal to 60 per cent. of the labour. The General Purposes Committee recommended that the Tramways Committee be authorised to proceed with the work on the understanding that £100,000 will be the limit of expenditure to be met by the department up to the end of December. Assuming that £60,000 of this £100,000 is for labour, and will rank for a 60 per cent. grant from Lord St. David's Committee, the Tramways Committee would be enabled to carry out works to a total value of £136,000 by the end of the year. With reference to the reorganisation of certain termini of the tramways, as mentioned in our issues of July 14 and September 17, a further improvement at Aston Cross may be noted. The loading place here up to now has been in the middle of the road, but as this arrangement is regarded as dangerous, the "island" which forms the site of the clock is being narrowed, and both sets of lines diverted to the proximity of the paving. Improvements to the stopping-place at Steelhouse Lane are also contemplated. The terminus for the new railless trolley car service on the Nechells route will be in Old Square. It is estimated that the Corporation tramways lost over £70,000 as a consequence of the coal strike. At the commencement of the strike the receipts at once declined about £1,000 per week. From May 3 the services were cut down 25 per cent., with a consequent further decrease of receipts of about £1,000 a week, and from May 22 to June 29 the services were entirely suspended. Since the end of the strike the receipts have continued to decrease, and are less than the corresponding returns last year by about £5,000 a week.

BLACKBURN.

Proposed Tramway Extensions.

The Corporation propose to include in the Bill which is being promoted in the next session of Parliament powers to extend the tramway system, and to run motor omnibuses within and outside the borough. Mr. A. R. Fearnley, general manager of Sheffield Corporation Tramways, was consulted by the Corporation, and the Bill is being framed in accordance with his advice.

BOLTON.

Tramway Fares Concession—Proposed Tramway Extensions.

There has been a reduction in fares on the tramways up to 9 a.m. daily since October 10, when a reversion was made until this hour to the old 1d. fares. No increase in fares had been found necessary in Bolton up to April last. Previous to that time the fare was 1d. for a stage of a mile and a half, but in April it became necessary to add a halfpenny per stage. The Tramways Committee then undertook to reduce fares if the additional receipts proved more than sufficient to meet the cost of the service. A few months' trial has enabled the committee to carry out their promise. The Corporation will promote a Bill in the next session for powers to extend the tramway system in various districts, and to run motor omnibuses to Egerton and in other directions within a radius of six miles from the Town Hall.

BOURNEMOUTH.

Tramway Fares Order Extended.

The Ministry of Transport has agreed to extend until February 1923 the Order granted to the Corporation giving authority to increase the tramway fares on the understanding that the Corporation agree to certain modifications (now accepted) in respect of the tramways leased from the Poole Corporation.

BRADFORD.

Horse Owners and Tramway Goods Traffic—Men's Wages.

Mr. G. V. Mackrell (secretary of the Bradford and District Horse Owners' Association) has written to the *Yorkshire Observer* deprecating the proposal of the Corporation Tramways Department to seek further powers in respect of the goods carrying department of the system. The letter alludes to the loss of some £4,000 on this department during the past financial year, and urges that the project for carrying heavy goods is unsound and would probably become a burden on the ratepayers. (It will be recalled that the Tramways Committee recently decided that if the Parcels Department is not paying by March next it will be closed.) The Tramways Committee have decided to reduce the wages in the parcels department. In spite of the fact that the work is now carried on at a heavy loss, the local branch of the United Vehicle Workers' Union has entered a protest and contends that the wages are fixed by national agreement.

DARTFORD.

Track Reconstruction Loan.

The Urban Council has received sanction to borrow £12,000 for reconstruction of the tramway track.

DOUGLAS (I.O.M.).

Cable Cars Suspended.

The Town Council have decided to substitute some of the cable cars by a service of omnibuses during the winter. There was a loss of nearly £4,000 on the cable cars last year.

EAST HAM.

Tramways and "Unfair Competition."

At a meeting of the Town Council on October 12, the report of the Electric Lighting and Tramways Committee, who had been inquiring into the operation of these departments, was considered. The committee's conclusions (which were summarised in our issue of October 8) met with some criticism. Councillor Newling (vice-chairman of the committee) said in common with tramway authorities throughout the country they found themselves in extreme difficulty. There had been large increases in the price of coal, in wages, and in other costs, and the undertaking was suffering from unfair competition. He would like to suggest that the Ministry of Transport be asked to place the omnibuses on a similar basis with regard to rates and taxes and responsibility for maintenance of highways as the tramcars. Competition was the key to the whole difficulty in relation to the tramways. The acceptance of the report was carried.

EDINBURGH.

Revision of Fares.

Revised fares are now in operation on the Corporation tramways. They consist chiefly of an extension of the majority of the former penny stages. The most notable concession is the reinstitution of the penny fare for the whole length of Princes Street. Readjustments have also been made with a view to a more convenient location of stopping-places.

GLASGOW.

Proposed Tramway Extensions and Fares—Assistance for Unemployed.

At a meeting of the City Council the Tramways Committee recommended that the Corporation should apply for Parliamentary powers to construct the proposed tramway between Baillieston and Coatbridge as a light railway on the south side of the roadway. Mr. T. A. Kerr moved that the matter be taken back for consideration of a scheme under which the tramway lines would be laid in the centre of the roadway, as authorised by the Glasgow Tramways and Bridges Act, 1914. He maintained that his scheme would mean the immediate employment of many idle men, while the other would be hung up for many months while Parliamentary powers were being obtained. The recommendation of the committee was carried. Mr. Reid moved the proposal—which was defeated in the Tramways Committee—that the halfpenny fare for one stage be re-instituted, leaving the other fares as at present. The committee's recommendation that no change should be made in the present fares was carried. The Statute Labour Committee of the Corporation have unanimously recommended that the erection

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of the new bridge across the Clyde at Oswald Street be proceeded with as soon as possible. The Tramways Committee are to contribute half the cost, and the bridge is intended to relieve street traffic congestion. The extensions to Millerston and on the London Road have been commenced. Arrangements are to be made for the road widening required in connection with the Cathkin Braes extension, in order to provide work for the unemployed. The tramway manager has been asked to report on the expediency of proceeding with the authorised extension from Clyde Bank to Duntocher. The conductors on the Corporation tramcars have been carrying a supply of special tickets, the proceeds from the sale of which to passengers go to augment the Lord Provost's fund for the relief of the unemployed. The tickets bear on one side the words: "Glasgow Corporation Tramways. RENT TICKET; One Penny"; and on the other: "UNEMPLOYMENT—If every person who has a job purchases a Rent Ticket daily, every necessitous unemployed person will be assured of a roof over his or her head during the hard winter months."

HUDDERSFIELD.

NEW ROUTE TO BRIGHOUSE—TRAMWAYS ASSIST UNEMPLOYED.

The Tramways Committee have decided to proceed with the construction of a portion of the new tramway route to Brighouse. Alderman Sellers said that the present time was suitable for the work, as about 400 men could be employed. At a meeting of the Town Council in October, Alderman E. H. Sellers (chairman of the Tramways Committee) referred to the work on the undertaking found for the unemployed. Since June 6 there had, on an average, been 250 men engaged, earning an average of £1 18s. 9d. per week. The committee have done all they possibly could for the unemployed by sharing out the work.

HULL.

TRAMWAY EXTENSION—DECREASED RECEIPTS.

The Tramways Committee have approved a scheme for extending the tramways to Hessle at an estimated cost of £36,000. There has been a decrease of about £1,000 a month in the receipts of the Corporation tramways. The manager stated at the beginning of October that the six months' working showed neither a profit nor loss. During that time they had had a coal strike, which cost them a considerable sum of money, and there had been nine or ten weeks of severe industrial depression. Now their receipts were dropping at the rate of £1,000 per month, there was not the necessity for the same number of men to be employed in the traffic department, but they had decided that under the circumstances no reduction should be made.

LEEDS.

WORK-SHARING SCHEME.

A scheme of work-sharing was inaugurated on the city tramways on October 26 with a view to obviating unemployment. Under an arrangement between the management and the United Vehicle Workers' Union, a number of surplus men were to be "played off" for a full week, their selection being decided by ballot. The remaining men were to be invited to contribute 1s. 6d. per week, or such sum as may be necessary, to pay the men drawn off an "almost equivalent" wage, and in default to have no claim if they are themselves "drawn off." Disciplinary action would follow against any man who, having contributed or drawn money, fails to keep up his contributions. Special duty or overtime is not to be worked. The men's union has appealed to its members to support the scheme, which is designed to retain men whose transfer to the ranks of the unemployed would at present be very undesirable.

LIVERPOOL.

TRAMWAY CHAIRMAN'S REVIEW—PRESCOT LIGHT RAILWAY.

Reviewing the past year's operation of Liverpool Tramways, Electric Power and Lighting Committee, the chairman (Mr. F. C. Wilson) said the tramway traffic returns for the first nine months of 1921, as compared with 1914, showed an increase in receipts of £608,282, an increase in passengers of 18,995,891, and an increase in earnings per car-mile of 15·97d. It was estimated that the loss in receipts, owing to the coal strike, amounted to £45,000. Under the present system in Liverpool, a passenger could travel up to 3¼ miles for 2d., which was equal to 1¾ miles for 1d., and was, he said, a longer distance than could be obtained on any other tramway system in the country. Sufficient experience had been gained with sleeper tracks to indicate that they showed a clear economy both in capital cost and in yearly maintenance and upkeep, while providing much more comfortable riding, and being a considerable benefit to resident frontages. Rails which last year cost £23 per ton could probably be obtained now at £16 per ton, and other materials were also showing a reduction. The Tramways Committee have recommended applications to the Minister of Transport, pursuant to Section 7 of the Liverpool and Prescot Light Railway (Amendment) Order, 1919, and Section 540 (5) of the Liverpool Corporation Act, 1921, for sanction to the borrowing of £312,200 for the reconstruction of the Prescot Light Railway from the city boundary to Brook Bridge, Prescot; and for sanction to the borrowing of the sum of £8,000 in respect of the purchase from the St. Helens Corporation, pursuant to Section 166 of the said Act, of Tramway No. 1, authorised by the St. Helens Corporation Act, 1898.

LONDON.

CHEAPER FARES—ROUTE EXTENSIONS—METROPOLITAN ELECTRIC TRAMWAYS LEASE.

A slight reduction has been made in the single fares on the Tooting and Hampton Court route of the London United Tramways. The fares between the principal points on this route are now one penny down. The cheap return fare between Tooting and Kingston, issued daily Mondays to Fridays inclusive, remains unaltered. The Hammersmith Council Law and Parliamentary Committee have recommended the Borough Council to make representations to the Ministry of Transport that the fares on the London United Tramways should be reduced, and that the actual stage points should be shown on the tickets rather than their indication by numbers. The committee have recommended also that other local authorities of the areas through which the cars of the London United Tramways run be invited to take similar action. Part of service No. 35 of the London County Council Tramways, which originally ran between Westminster and Highbury, has been extended along the whole length of Holloway Road to Highgate (Archway Tavern). Middlesex County Council have considered a proposal by the Highways Committee to extend the lease of the light railways and tramways to the Metropolitan Electric Tramways, Limited, for a further term from 1930. The matter occasioned much discussion. It was alleged that though some £2,250,000 of public money was sunk in the undertaking, the county had lost about £200,000. The proposal was referred back with a request that the committee would report at the next meeting as to the heads of the present agreement, showing what had been the financial result of working to date, and the effect on the undertaking's finances of the recent increase of fares.

MANCHESTER.

TRAMWAY ENGINEERS' STRIKE—NEW CHORLTON ROUTE.

As a protest against the reduction of their wages by 2d. per hour, skilled engineers in the maintenance department of the Corporation tramways came out on strike on October 20. About half-a-dozen unions were affected. It is understood that the amount of the reduction corresponds to an increase in wages granted to the men last year. Major Hall inspected the new route of the Corporation tramways from Chorlton-cum-Hardy via Seymour Grove and City Road to Albert Square, on October 26, and the line was opened the following day. It affords a quicker route into the city.

NEWCASTLE-ON-TYNE.

PROPOSED INCREASE IN WORKING HOURS.

The Tramways and Transport Committee have decided to ask the City Council to rescind the resolution fixing the maximum number of working hours for their employees at 44 per week. It is understood that the committee desire to bring the practice at Newcastle into uniformity with the national arrangements. If this is approved by the Council, each committee will be at liberty to fix the hours of its employees.

PRESTON.

NEW POWER PLANT.

The Corporation have decided, on the recommendation of the Electricity Sub-committee and Tramways Committee, that a turbo-generator and auxiliary machinery be installed at the tramway power station, at an estimated cost of £17,650, and that application be made for sanction of the Government department for the necessary expenditure.

STOKE-ON-TRENT.

TRAMWAYS LEASE.

The Stoke-on-Trent Council decided not to increase the term of the lease of the tramways to the Potteries Electric Traction Company, Limited. The present lease is one of seven years, and expires in 1924.

SWANSEA.

NEW TRAILER CARS.

The Tramways Committee have purchased seven new cars to be used as trailers.

WALTHAMSTOW.

COUNCIL TRAMWAYS AND THE LONDON COUNTY COUNCIL—PENNY FARES.

The Urban Council have decided to invite the London County Council to take over and work their tramway system, which has now a heavy debt. Increased fares have not relieved the financial position, and it is felt that the example of Leyton (which recently entered into a working agreement with the London County Council) might well be followed. Walthamstow Council have a Labour majority. The Council have decided to revert to penny fares on the Chingford route, as the three-halfpenny fares have not increased the revenue.

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PERSONAL.

Mr. W. A. Toppin, assistant manager of Chesterfield electricity and tramways department, has resigned.

Mr. Leonard Andrews, formerly borough electrical engineer of Hastings, has taken offices at 104 Victoria Street, S.W., as a consulting engineer.

Sir Philip Dawson, K.B.E., who was recently elected member of Parliament for West Lewisham, took his seat in the House of Commons on October 18.

Colonel O. C. Armstrong, D.S.O. (chairman of Greenwood and Batley, Leeds), has been elected President of the Federation of British Industries, in succession to Sir W. Peter Rylands.

Mr. William Hall has been appointed a member of the Highways Committee of the London County Council, which controls the tramways, in place of Mr. J. Herbert Hunter, who has resigned.

Mr. Edgar Moxon, late borough electrical engineer of South Shields, who has been appointed to a similar post at Southport, will receive a salary of £750, rising by annual increments of £50 to £1,000.

Sir Francis Dunnell, K.C.B., has resigned the post of secretary and solicitor to the Ministry of Transport, and has returned to York to resume his position as secretary and solicitor to the North Eastern Railway Company.

Mr. John William Thorpe has been appointed rolling stock and works superintendent in the Liverpool tramways department, at a salary of £750 per annum, inclusive of bonus and all emoluments, the engagement to be determinable by three calendar months' notice, to expire on the last day of any calendar month.

Mr. J. W. Hame, electrical engineer and tramway manager of York Corporation, who recently tendered his resignation owing to ill-health, has been retained as consulting engineer. His resignation will take effect at the end of November, and the tramways and electricity department will then be separated, and a tramway manager appointed.

Mr. G. W. O. Howe, D.Sc., has been appointed to the newly-founded James Watt Chair of Electrical Engineering in the University of Glasgow. Mr. Howe has been head of the Department of Standards and Measurements in the National Physical Laboratory at Teddington. He received his academic training at the Armstrong College, Newcastle, and was for some time assistant lecturer on electrical engineering at the City and Guilds Engineering College.

Mr. E. Hoadley, engineer and manager of Maidstone Corporation electricity undertaking, has been appointed honorary secretary of the Electric Vehicle Committee, in succession to Mr. F. Ayton, who has held the position since the formation of the committee and who resigned upon his appointment as joint managing director of Ransomes, Sims and Jefferies, Limited. All communications in connection with the Electric Vehicle Committee should be addressed to Mr. E. Hoadley, Electricity Works, Maidstone, Kent.

Mr. E. H. Bond, general manager of Dover Corporation Tramways, has been presented with a handsome enlarged photographic group of the whole of the staff, set in a deep fumed oak frame, suitably inscribed, as a mark of their high esteem. The presentation was made at a gathering in the Council Chamber by Councillor R. J. Barwick (chairman of the Tramways Committee), who spoke highly of Mr. Bond's service and the good feeling which existed between the manager and staff. In acknowledging the gift, Mr. Bond said Dover had as capable and loyal a staff as one could wish.

Mr. J. B. Hamilton, who sailed on November 3 for Shanghai and a trip round the world, was entertained to dinner on October 20 by his colleagues on the National Joint Industrial Council for the tramway industry. The dinner took place at the Engineers' club, and those present included, besides representatives of the Council, a number of friends of Mr. Hamilton, who, while not on the Council, were glad to take the opportunity of wishing him *bon voyage*. Arrangements for the dinner were in the hands of Mr. J. Beckett and Mr. A. de Turckheim, and the occasion proved highly enjoyable. Mr. W. J. Squires, chairman of the National Joint Board and of the Highways Committee of the London County Council, presided, and at the conclusion of his remarks presented Mr. Hamilton on behalf of those present with a silver cigarette case as a souvenir of the occasion and a mark of appreciation of the British tramway world for the services he has rendered to the industry, especially during the past year. Other speakers included Alderman H. Brown, vice-chairman of the Leeds Tramways Committee, who alluded to the high regard in which Mr. Hamilton is held by the members of the Leeds Council and the citizens generally. Appropriate and amusing remarks were also made by Mr. C. J. Spencer, general manager of the Metropolitan Electric Tramways, Limited, Mr. R. J. Howley, and others.

CONTRACTS AND ORDERS.

Rochdale Tramway Committee have accepted the tender of the Titan Trackwork Company, Limited, to supply automatic points.

The Rail Welding Company, Limited, have an order for welding and re-treading 500 tramway rail joints for Salford Corporation tramways.

Dundee Tramways Committee have placed a contract for 100 tons of tramway rails with the local firm of Messrs. Brown and Tawse, at £13 7s. 6d. per ton.

Walter Scott, Limited, have a contract to supply 300 tons of tramway rails to Blackpool Corporation tramways. The rails are required for the construction of track in Lytham Road South.

Rails for Sunderland.—The Town Council has rescinded its resolution directing the Tramways Committee to purchase British instead of foreign rails, and the whole matter is to be investigated.

Halifax Tramways Committee have recommended that the quotation of Messrs. George Robson and Company, Sheffield, for the supply of one of their No. 2 portable patent electric grinding machines for £140 be accepted.

Sunderland Electricity Committee have accepted the tender of the Pirelli General Cable Works for five single core low-pressure cable, and of the British Insulated and Helsby Cables, Limited, for two and three core low-pressure cable.

Yarmouth Tramways Committee have authorised the manager to obtain 14 cast steel gear wheels from Alfred Wiseman, Limited, at £8 8s. each, and (for use on two cars as an experiment) 4 forged nickel chrome steel gear wheels, surface hardened, from Vickers, Limited, at £15 each.

Leyland Omnibuses for Preston.—Preston Corporation Tramways Committee have recommended acceptance of the tenders of Leyland Motors, Limited, for the supply of three motor omnibus chassis for £3,340 10s., and the English Electric Company, Limited, of Preston, for three omnibus bodies for £1,425.

The Peckham Truck and Engineering Company, Limited, manufacturers of the well-known Peckham pendulum truck, have received intimation that they are shortly to receive the official order for 51 Peckham pendulum trucks with 8 ft. 6 in. wheel base, for the new Edinburgh electric cars and also for the cars now being reconstructed.

The Leeds Tramways Committee have accepted the following tenders—2,000 flexible copper bonds, British Insulated and Helsby Cables, Limited; 50 tons of curved section rails, Walter Scott, Limited; 400 single and 100 double guard rail checks, Edgar Allen and Company, Limited; 26 200-ampere switches for section boxes, Tramway Supplies, Limited.

Newcastle-on-Tyne Transport and Electricity Committee have recommended acceptance of the tender of Bolckow, Vaughan and Company, Middlesbrough, at £12 10s. per ton, for the 1,500 tons of rails required for extending the track from Barras Bridge to the High Level Bridge by way of Percy Street, Newgate Street, and the Groat and Cloth Markets. The nearest foreign tender was stated to be very little below the one accepted.

British Tyres for Sheffield Cars.—Sheffield Corporation Tramways Committee recently received 15 tenders for the supply of 400 steel tramcar tyres to British standard specification. The three lowest were for tyres of Continental manufacture, prices varying from £2 8s. 3d. to £2 15s. 6d. per tyre. The remaining tenders were from local firms, the prices ranging from £3 12s. to £5 1s. per tyre. The committee, after carefully taking all the circumstances into consideration, recommended the acceptance of the tender of Steel, Peech and Tozer, Limited, at the rate of £3 12s. per tyre. By accepting this tender the committee will pay £475 more than they would have done if they accepted the lowest tender for tyres of Continental manufacture.

BUSINESS NOTICES.

EDWARD LE BAS AND COMPANY, of Dock House, Billiter Street, E.C.3, have issued a very comprehensive and neatly illustrated catalogue of some 7,500 varieties of G.F. malleable tube fittings.

"T.B.R." (TRAVEL BY ROAD), the excellent and handy little guide to the whole of the omnibus and motor coach services in the kingdom, has again made its monthly appearance. Conveniently indexed, replete with maps and clearly printed, it is a worthy addition to the standard directories.

THE INDUSTRIAL LEAGUE AND COUNCIL, of 82, Victoria Street, S.W.1, has been registered as a company limited by guarantee. The objects are to promote British home, overseas dominions, and foreign trade and commerce. Every member is to contribute a sum not exceeding 5s. The directors are Viscount Burnham, Mr. G. H. Roberts, M.P., Sir W. J. Peakemason, Mr. H. Hirst, Mr. R. Young, M.P., Mr. H. Scholey, and Mr. G. Latham.

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MESSRS. ALFRED INGRAM AND COMPANY, of Queen Anne's Chambers, Westminster, owing to the requirements of the Ministry of Labour, have been obliged to vacate the offices they have occupied for the past sixteen years, and have removed to 1, Central Buildings, Westminster, S.W.1, to which address all communications should be sent on and after November 28. Messrs. Ingram are the selling agents for the steel back brake blocks and collector shoes which, in conjunction with Pease and Partners, Limited, they have perfected, and which are now widely used on railways and tramways.

ANTI-DAZZLE LAMPS.—Messrs. C. A. Vandervell and Company, Limited, have pleasure in announcing that after a long period spent in testing every kind of anti-dazzle device submitted to them for motor lamps, they have decided that the one which will meet the requirements and is nearest to the ideals of the Transport Ministry, is that made under the Grubb patents. Messrs. C. A. Vandervell and Company, Limited, have therefore arranged with Sir Howard Grubb and Sons, Limited, to take over the world's right for manufacture. The lamp in future will be known as the C.A.V. Non-dazzle Lamp.

"ROAD REINFORCEMENT."—The sixteenth number of the attractive booklet under this title issued by the British Reinforced Concrete Engineering Company contains several informative articles on transport problems. In the course of one headed "Roads which will pay," the writer states—"The fact is that our roads could be made strong enough to keep their foundation secure, and their surfaces smooth and level under the regular battering of commercial traffic, just as permanently as railway tracks maintain their condition. The cost of putting our roads into that state would be trifling when compared with the saving which would be effected in the cost of motor haulage."

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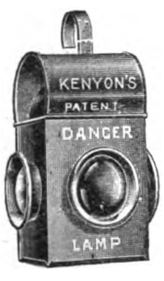

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PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Motor vehicles (26,163)—Birmingham Small Arms Company, Limited and F. W. Hulse.
Bodies of motor chars-a-bancs and omnibuses (26,418)—C. Dodson.
Direction indicator for motor vehicles (26,559)—T. Hopkins.
Brake systems for self-propelled vehicles (26,256)—K. Maybach.
Tramway and railway rails (26,477)—C. P. Sandberg.
Overhead electric transmission (26,258)—A. M. Taylor.
Transmission of electric power by underground cables (26,633)—A. M. Taylor.
Indicator for motor vehicles (26,046)—G. Walsh.
Brakes for tramway and railway vehicles (26,336)—T. Zweigbergk.
Current transmission devices for ball bearings in electric rail vehicles (26,887)—Ball Bearing Works, J. Schmid-Roost, Ltd.
Motor lorry bodies (27,223)—W. Challands, E. J. Durham and R. H. Ross.
Differential gear for motor vehicles (27,079)—M. Fischer.
Motor vehicles (27,427)—W. L. Garrett.
Lifting jacks (26,691)—A. E. Jake.
Motor vehicles (27,290)—J. J. Mayrow.
Indicators for road or rail vehicles (26,824)—W. J. Smith and Tramway Supplies, Limited.
Motor vehicles (26,776)—A. S. Watts.
Lifting jacks (27,576)—G. T. Adams.
Brakes of tramcars (27,639)—English Electric Company and H. H. Andrews.
Resilient mountings for articles on vehicles, etc. (27,916)—Bristol Tramways and Carriage Company, Limited and B. A. Payne.
Self-propelled vehicles (27,779)—E. S. Cook and R. H. Simpson.
Motor vehicles (27,837)—Z. Crabtree.
Systems of operation for electric trams (27,901)—W. P. Durtnall.
Tramcars (28,018)—W. P. Durtnall.
Trolley collectors for electric tramcars or motor vehicles (27,622)—E. P. B. Estler and Brothers.
Electric railway motor control systems (28,016)—Metropolitan-Vickers Electrical Company, Limited.
System of steering trailer vehicles (28,121)—G. Page.
Device for rendering inoperative simultaneously prime movers and brakes of mechanical vehicles (27,690)—E. W. Park and H. Rose.
Rail-fastening devices (27,660)—L. P. Winby.
Lifting jacks (28,595, 28,596 and 28,597—A. E. Berriman and Burton, Griffiths and Company, Limited.
Power transmission systems of motor vehicles (28,478)—F. A. Colling and S. J. Sapsford.
Electric trams and road vehicles (28,460)—W. P. Durtnall.
Route indicators (28,586)—E. H. H. Gordon.
Controlling gear of self-propelled vehicles (28,520)—C. E. James.
Change-speed gears for petrol-driven vehicles (28,608)—G. J. Rackham.
Mechanism for operation of brakes in motor vehicles (28,307)—A. E. Rouvier.
Mounting gear boxes upon motor vehicles (28,785)—Standard Motor Company, Limited and R. W. Maudslay.

SPECIFICATIONS PUBLISHED

1920

Welding of fish-plates on tramway rails (15,219—*168,664*)—E. Jacob and C. D. Burnet.
Supports for rails (21,187—*168,743*)—O. Valeri.
Steering mechanism for motor-driven vehicles (27,803—*168,792*)—J. R. Kunzelman, B. Skare, D. H. Persons, J. G. Lindquist, J. A. Chisholm and J. Eliason.
Spring suspended front axles for motor vehicles (15,507—*151,239*)—Oesterreichische Waffenfabriks Ges.
Steering gear for mechanically-propelled vehicles (16,330—*169,011*)—Marles Steering Company, Limited and H. Marles.
Motor vehicles (14,040—*144,620*)—Maybach Motorenbau Ges.
Means of controlling the power in motor-driven vehicles (14,533—*169,214*)—T. C. G. Clabburn.
Steering mechanism for vehicles (28,447—*152,035*)—O. A. Janemian.
Brakes for motor vehicles (12,438—*169,479*)—S. E. Alley.
Life guards for vehicle wheels (17,298—*169,507*)—G. J. Shave and London General Omnibus Company, Limited.
Keys for holding tramway and tramroad rails in their chairs (17,467—*169,518*)—L. Green and W. A. Buyers.
Fishplates for rails (17,512—*169,521*)—W. S. Backen.
Means for preventing the creeping of rails (17,915—*169,534*)—W. J. Mellersh-Jackson (*P. & M. Company*).
Motor vehicles (20,191—*148,255*)—R. Conrad.
Rail fasteners and joints for flanged rails and metallic sleepers (26,995—*169,622*)—E. S. Rayner.
Trolley heads for electric traction vehicles (27,692—*169,627*)—Shanghai Electric Construction Company, Limited (*D. McColl*).
Rail joints (31,564—*169,639*)—H. E. Swanson.

1921

Bogies for railway, etc., vehicles (474—*168,815*)—A. L. McColl.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	Oct. 9	Oct. 16	Oct. 23	Oct. 30	Nov. 6	Oct. 8	Oct. 15	Oct. 22	Oct. 29	Nov. 5	Wks	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Aberdeen Corporation	3,876	3,738	3,576	3,605	3,505	3,550	3,550	3,472	3,235	3,435	22½	83,460	– 7,892
Aberdeen Motor Buses	...	...	...	...	...	144	...	150	130	121	22½	7,085	+ 6,330
Ayr Corporation	604	595	551	550	521	578	554	504	526	502	25	21,870	– 1,014
Barrow Corporation	962	971	871	905	876	801	823	776	773	846	31	27,830	– 602
Belfast City Tramways	11,055	11,638	11,487	11,408	11,040	12,822	12,897	12,660	12,351	12,529	31	395,437	+ 37,431
Birkenhead Corporation	2,936	2,865	2,691	2,708	2,726	2,810	2,784	2,601	2,614	2,698	30½	82,356	– 11,361
Birkenhead Motor 'Buses	439	431	389	386	378	614	649	510	579	517	30½	23,020	+ 9,216
Birmingham Corporation	34,973	34,686	33,374	33,296	32,963	30,252	30,258	29,502	29,033	29,812	31	917,666	– 56,937
Birmingham Motor 'Buses	2,045	2,056	1,935	1,916	1,843	2,021	2,055	1,878	1,772	1,781	31	65,486	+ 752
Blackburn Corporation	2,615	2,953	2,555	2,147	1,803	2,701	2,642	2,715	2,567	2,649	31½	76,815	– 7,852
Bradford Corporation	14,777	16,075	14,116	14,741	15,114	14,363	15,454	13,970	14,869	14,000	31	431,336	+ 21,506
Burnley Corporation	3,964	3,720	3,409	2,630*	2,574*	3,506	3,598	3,420	3,373	3,576	—	—	—
Burton-on-Trent Corporation	714	647	614	539	560	750	640	655	626	597	31	20,059	+ 1,145
Bury Corporation	2,779	2,600	2,045	1,826	1,746	2,557	2,622	2,389	2,452	2,388	28½	78,812	– 4,113
Chatham and District	1,963	1,900	1,769	1,658	1,624	2,023	1,872	1,769	1,620	1,601	44	74,414	– 2,479
Chesterfield Corporation	...	...	...	536	501	...	...	...	590	588	31	18,413	+ 166
Chesterfield Motor Buses	...	...	...	825	743	...	...	...	804	820	31	24,178	– 327
Derby Corporation	2,370	2,356	2,250	2,156	2,205	2,364	2,244	2,196	2,117	2,152	31	68,459	– 3,604
Dundee City	3,276	3,214	3,180	3,190	3,130	3,147	3,336	3,152	3,046	3,134	24½	81,361	+ 7,778
East Ham Corporation	2,226	2,232	2,134	2,090	2,113	2,173	2,165	2,091	2,037	2,186	31½	66,720	+ 3,769
Edinburgh Corporation	14,538	13,830	13,277	13,439	13,581	13,255	12,985	11,940	12,134	12,213	25	334,102	– 18,199
Edinburgh Motor 'Buses	970	963	1,031	1,053	1,406	3,524	3,450	3,173	3,242	3,343	25	97,966	+ 76,125
Glasgow Corporation	48,799	47,602	47,073	45,824	46,256	47,737	47,771	45,695	46,288	46,503	22½	1,036,379	+ 36,163
Glossop (Urban Elec. Supply Co.)	289	277	264	259	260	260	260	248	247	248	45	10,656	+ 31
Halifax Corporation	4,628	4,769	4,671	4,165	4,085	4,589	4,698	4,748	4,393	4,410	29½	137,551	+ 5,995
Halifax Motor 'Buses	119	114	113	98	100	62	61	73	62	66	29½	2,597	– 842
Halifax Railless Cars	...	...	...	...	...	56	58	50	55	49	15	923	—
Huddersfield Corporation	5,512	5,385	5,229	5,228	5,059	5,117	5,400	5,050	4,993	5,116	32	170,744	+ 12,794
Ilford U.D. Council	1,387	1,352	1,254	1,282	1,247	1,521	1,489	1,439	1,423	1,475	31½	48,170	+ 7,210
Ipswich Corporation	1,038	970	891	894	814	968	923	864	818	823	31	28,344	– 3,869
Isle of Thanet	1,073	931	740	521	457	1,240	1,033	908	707	716	5	4,235	+ 688
Kilmarnock Corporation	383	358	347	350	341	370	356	362	357	361	24½	9,269	+ 53
Leicester Corporation	7,121	7,093	6 631	6,178	6,350	7,462	7,597	7,398	7,062	7,404	—	—	—
Liverpool Corporation	28,425	28,926	25,753	24,769	25,220	31,035	31,355	29,619	29,326	30,349	44½	1,283,192	+ 74,528
London County Council	104,273	105,563	102,142	101,112	100,980	102,420	103,690	102,116	99,093	101,758	31	3,123,081	+ 356,548
Maidstone Corporation	563	508	487	454	429	659	505	501	438	440	30	15,656	– 286
Manchester Corporation	39,245	39,717	38,349	37,007	35,743	39,218	39,793	38,697	38,338	38,283	31	1,234,817	+ 194,863
Newcastle-on-Tyne Corporation	11,571	11,232	11,120	11,140	11,035	11,624	11,840	12,101	11,492	11,305	31	358,949	+ 16,414
Nottingham Corporation	8,690	8,833	7,558	7,378	7,234	8,560	8,681	7,800	7,521	7,598	31	205,219	– 39,538
Oldham Corporation	5,066	4,892	4,758	4,686	4,521	5,152	5,099	4,728	4,899	4,694	33	157,880	+ 3,076
Preston Corporation	...	...	1,756	1,649	1,639	...	...	1,911	1,850	1,876	30½	59,854	+ 4,264
Reading Corporation	1,693	1,725	1,658	1,551	1,478	1,725	1,711	1,546	1,521	1,581	31	50,179	– 2,553
Reading Motor 'Buses	284	286	246	237	222	351	347	325	294	313	31	11,177	+ 2,810
Rotherham Corporation	2,743	2,813	2,774	2,488	2,534	2,456	2,492	2,418	2,326	2,373	30	68,025	– 12,839
St. Helens Corporation	2,213	2,373	2,138	1,978	1,769	1,621	1,675	1,580	1,437	1,498	31	58,861	– 9,994
Sheffield Corporation	21,629	21,078	20,814	19,904*	19,873	20,239	20,227	19,499	19,708	19,496	31½	621,467	– 39,454
Southampton Corporation	3,424	3,391	3,200	3,287	3,049	3,274	3,217	3,122	2,931	3,018	31	92,911	– 6,185
Southampton Motor 'Buses	234	246	222	234	212	99	104	103	99	101	31	5,533	– 1,547
Southend Corporation	2,061	2,022	1,959	1,823	1,634	2,599	2,491	2,312	2,043	2,095	32	86,364	+ 3,421
South Shields Corporation	2,030	1,918	1,903	1,806	...	1,854	1,777	1,729	1,821	...	31	52,086	– 7,725
Sunderland Corporation	3,032	2,984	2,905	2 801	2,787	2,811	2,677	2,672	2,636	2,588	31	84,049	– 14,667
Swindon Corporation	381	398	385	351	357	427	449	398	369	371	30½	12,761	+ 468
Tyneside Tramways and Tramroads	1,270	1,317	1,201	1,262	...	1,080	1,137	1,505	942	...	17	19,880	– 2,973
Wallasey Corporation	2,500	2,514	2,301	2,323	2,242	2,810	2,892	2,742	2,738	2,774	31½	90,716	+ 6,913
Wallasey Motor 'Buses	154	165	142	120	147	252	198	234	185	213	31½	7,960	+ 2,090
Walsall Corporation	1,764	1,780	1,682	1,705	1,592	1,670	1,667	1,625	1,583	1,620	32	52,207	– 3,412
Walsall Motor 'Buses	1,212	1,189	1,039	969	975	929	940	902	890	901	32	29,901	– 5,190
Walthamstow U.D. Council	2,100	1,989	1,861	1,915	1,828	2,071	2,008	1,850	1,860	1,938	31½	68,337	+ 2,306
Warrington Corporation	1,040	1,037	999	991	1,013	1,034	994	963	962	1,170	31	30,650	– 305
West Ham Corporation	6,325	6,350	6,046	5,903	6,026	6,036	6,202	5,934	5,810	6,126	31	184,571	+ 9,878
Wolverhampton Corporation	2,720	2,336	2,338	2,246	2,331	2,602	2,386	2,248	2,355	2,285	32	75,572	– 3,238
Wolverhampton Motor 'Buses	475	465	457	457	453	660	636	636	639	627	32	20.981	+ 7,309

* Curtailed service owing to coal strike.

Underground Electric Railways Company of London, Limited.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	Oct. 9	Oct. 16	Oct. 23	Oct. 30	Nov. 6	Oct. 8	Oct. 15	Oct. 22	Oct. 29	Nov. 5	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Underground Rlys. & L.G.O. Co.	...	...	...	...	...	250,509	246,951	238,732	228,148	229,190	44	10,496,795	—
London and Suburban Traction	...	...	...	...	...	58,929	57,783	54,539	51,252	51,514	44	2,446,955	—

Colonial and Foreign Tramway Traffic Returns.

Companies Issuing Weekly Returns.

NAME OF COMPANY.	1920. WEEKS ENDED					1921. WEEKS ENDED					AGGREGATE.		
	Oct. 9	Oct. 16	Oct. 23	Oct. 30	Nov. 6	Oct. 8	Oct. 15	Oct. 22	Oct. 29	Nov. 5	Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	£
Anglo-Argentine	79,844	80,335	81,224	80,064	80.478	79,079	85,527	82.195	84.063	86,049	44	3.517.538	+ 167210
Calcutta Rs.	59 472	91,196	99,411	80.849	85,875	105,728	95,020	86,756	24,551*	6,414*	47	3,473,176	– 615,494
Madras Rs.	(2 weeks)	51,484	(2 weeks)	49,003	...	(2 weeks)	45,814	(2 weeks)	45.810	...	40	826,014	– 171,122
Pernambuco	5,557	5.550	5,600	5,608	5,855	3.978	3.792	3.708	3.762	4.029	44½	165.767	– 131.750

* Decrease owing to strike of traffic staff.

Companies Issuing Monthly Statements only.

	1920.						1921.						Wks.	AGGREGATE.	
	May	June	July	Aug.	Sept.	Oct.	May	June	July	Aug.	Sept.	Oct.		1921.	+ or –.
	£	£	£	£	£	£	£	£	£	£	£	£		£	
Ballarat & Bendigo	3,673	3,672	3.690	3,588	4,192	...	4,570	4,134	3,842	3,809	4,231	...	24	25,706	+ 1,958
Brazilian Trac. Mlrs	10985000	10874000	11745000	11837000	12043000	...	14462000	14257000	15477000	15744000	14471000	...	39	125,891,000	+ 29226000
Brisbane	...	...	53,300	46,650	45,430	46,310	...	...	48,850	50,675	46,220	47,880	44	471,920	+ 12,590
British Columbia $	720,004	710,210	788,402	310,608	...	...	774,523	750,907	840,155	344,154	...	...	9	1,684,309	+ 85,299
Buenos Ayres L'c'z.	54,563	50,635	51,508	53,952	53,603	57,619	58,492	51,071	51,944	55,673	55,873	58,492	17	222,182	+ 5,500
Burma	46,783	50,471	52,289	48,553	50,235	55,763	48,353	54,275	43,764	55,168	58,974	64,778	13	178,920	+ 24,359
Cape Town	24,395	...	23,711	...	23,699	...	27,407	25,038	25,571	25,164	25,755	...	—	—	—
Carthagena & H.	5,313	5,562	4,164	3,721	2.273	3,319	1,602	1,410	1,936	1,773	4,244	3,862	44	26,098	– 15,985
Cordoba	...	...	20.189	21,028	19,597	...	...	...	23,629	23,851	23,204	...	26	139,450	+ 19,070
East India	3,980	3,862	4,081	4,109	4,228	...	4,392	4,078	4,591	4,513	4,154	...	8	8,667	+ 330
Kalgoorlie	3,276	3,029	3,194	...	...	...	2,362	2,308	2,350	...	...	...	30	14,638	– 6,499
La Plata	...	...	5,353	...	...	6,311	...	...	5,425	...	...	6,587	44	51,645	– 4,532
Manila $	261,803	267,169	282,260	292,418	280,352	...	293,873	310,559	305,126	297,128	322,212	...	39	2,734,631	+ 278,757
Monte Video	42,401	39,989	39,647	42,771	41,816	45,246	46,579	42,960	42,411	44,672	44,927	47,927	52	555,723	+ 39,585
Para	25,831	25,392	24243	24,571	23,174	...	24,755	24,884	24,655	22,940	22,225	...	43	239,119	– 6,734
Port Elizabeth	6,165	...	6,106	...	5,803	...	6,304	6,180	6,515	6,578	6,477	...	—	—	—
Rangoon Rs.	119,000	117,735	118,667	117,836	114,857	111,830	138.950	130,000	133,536	133,000	132,225	151,000	44	1,345,301	+ 170.016
Toronto $	1206,930	1127,239	1189,315	...	...	...	1271,306	1295,701	1229,483	...	...	...	31	8.877,669	+ 642,606
Winnipeg $	404,742	407,625	391,709	368.616	...	...	433,836	432,894	390,109	393,823	...	...	34	3,574,602	+ 169,600

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Daimler Commercial Vehicles

The Performance of Chassis No. 3021

UNICORN BREWERY
IPSWICH
Sept. 21st 1921

To MESSRS. DAIMLER CO.

DEAR SIRS

I thought the following particulars of our Daimler 2-3 tonner, supplied by you in July, 1919, might be of interest. The Chassis No. is 3021; Engine No. 31650.

The Lorry has been running continuously for 2 years 3 months, and has totalled up an approximate mileage of 25,000. I am now having it overhauled and the first new set of tyres put on the back wheels.

The Lorry is running now as sweetly as when it was first delivered, and the following are the only repairs and replacements recorded against it:

	£	s.	d.
Adjusting brakes		2	9
¼ Greaser (lost)		3	0
Dynamo repairs		18	6
„ brushes		5	9
Repairs to magneto		16	6
4 Platinum points	1	0	6
4 Plugs	1	0	0
Carbon brush		1	0
Water pipe repairs	1	9	2
Expenses sending out to repair magneto	1	10	3
4 Plugs	1	0	0
New points		7	0
Tune engines, repairs to brakes		10	6
4 Plugs	1	0	0
Straightening starting handle		2	6
Total	10	7	5

This works out at about £4 12s. a year, a fact which speaks for itself. I cannot say how more than satisfied we have been, and I know of no other Lorry which could have done half the work at the same expense. The Lorry was supplied to us through Messrs. Lock & Stagg, of Ipswich, and they have done the few repairs &c. themselves.

We are, dear Sirs
Yours faithfully
For THE UNICORN BREWERY CO. LTD.
(Signed) CYRIL CATCHPOLE, *Managing Director*

Daimler

THE DAIMLER COMPANY LIMITED
COVENTRY

11

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Regd.

AEC

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For Goods - - - 3, 4 & 5 TONNERS

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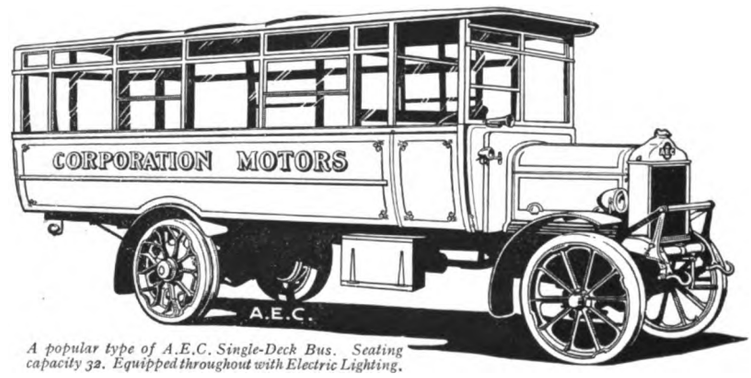

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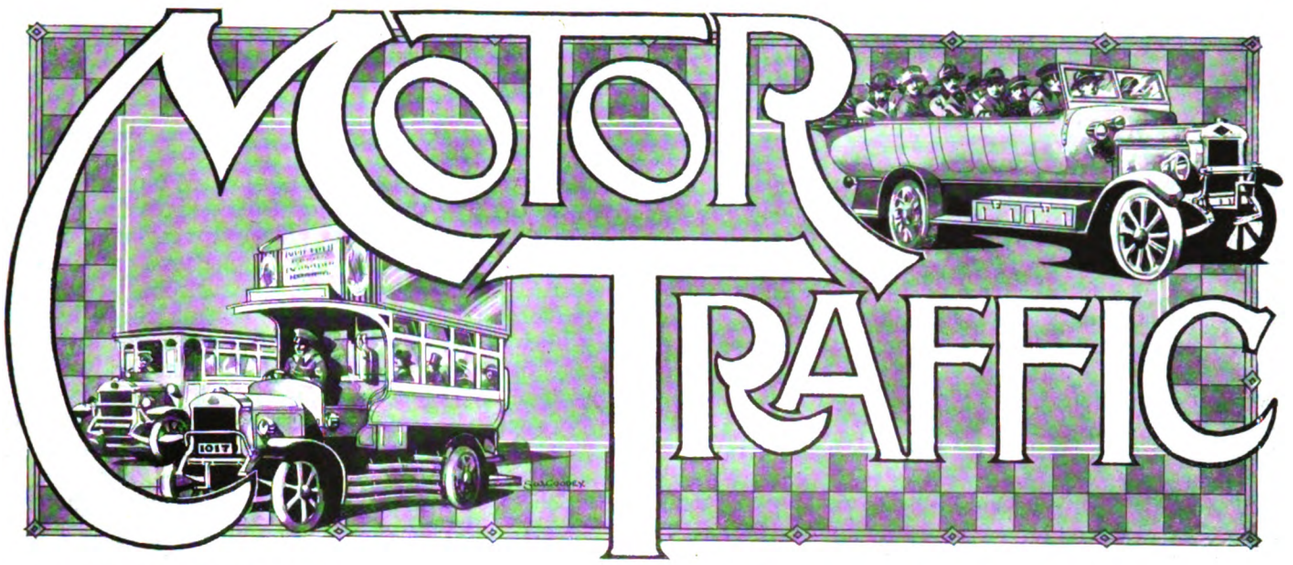

THE COMMERCIAL VEHICLE SHOW.

From the engineering standpoint the recent Commercial Vehicle Show indicated a marked advance over all its predecessors. While originality was not absent, anything in the nature of "freak" design appears to have been entirely eliminated from the industry's products. The great majority of the exhibits, as will be seen from the descriptions of the leading features given in this issue, were noteworthy for sound straightforward design, aiming at and achieving a high degree of simplicity, some weight reduction, and the elimination of practically all unessential costs of production. Prices have certainly been brought down to the lowest possible level. From the standpoint of the motor industry they are, in fact, in many cases too low. Certainly in plenty of instances the price quoted is lower than the actual cost of production of the various parts and of their subsequent assembly. This does not necessarily mean that the price is altogether uncommercial. Parts that were made or materials that were purchased some time ago do not represent the same value to-day that they did in the first instance. Consequently, while prices at the moment may be, as remarked, below cost, it does not follow that a vehicle cannot now be built at the quoted price and sold at a profit. In certain instances, however, the figures quoted, especially when one allows for some discount to agents and to the possibility of still further cuts in bargaining, do, in fact, represent a loss which can only be justified either on the grounds that it is better to make some temporary loss than to stop production altogether, or else on the grounds that reductions in production costs may be expected at an early date, and that it is sound policy to encourage trade revival by making the prices quoted anticipatory. Assuming that a gradual revival is actually taking place, it is perfectly certain that prospective purchasers have nothing to gain by holding back any longer. If trade continues to improve, any reductions in works cost that it may be possible to effect for some time to come will not be accompanied by reductions in selling prices, but will go towards the gradual establishment of a decent margin of profit without which the industry cannot continue permanently in being. Manufacturers have, therefore, adopted a wise course with regard to their present and prospective customers. That their policy will be duly appreciated we have little doubt. These are times when not a little goodwill can be gained by boldly facing the facts of the situation and, where necessary, by cutting down prices to an absolute limit.

PASSENGER VEHICLE DEVELOPMENTS.

Undoubtedly the passenger-carrying vehicles at the show received their full measure of attention from the visitors. The attendance at the show was quite satisfactory, both numerically and as regards its quality. Some business was done on the spot, both in goods and in passenger-carrying vehicles, and perfectly genuine inquiries, which are only held up by temporary shortage of liquid assets, were even more numerous. The appeal of the passenger vehicle was accentuated by many exhibitors, probably because people operating road motor services have this summer done so well that they are in the fortunate and rather uncommon position of having a fair amount of cash in hand and being capable of developing their services further without any delay. The motor coach for all-the-year-round services was prominent, probably more prominent than its actual prospects entirely justified. The successful operation of such vehicles for the present will probably be the exception rather than the rule, since the special inducements which divert custom from the rail to the road in the summer do not apply when the use of an enclosed vehicle becomes necessary. As regards the majority of large coaches at the show, there is a satisfactory indication of at least some attempt being made to provide space for passengers' luggage. The movement will probably, however, have to go further. The available space is always strictly limited, and when it is used for miscellaneous baggage a fair proportion of it must generally be wasted. There are therefore strong reasons in favour of the introduction of a system involving the carriage of standard receptacles which could be loaned to passengers who have booked their seats, and subsequently collected from them.

THE TYRE QUESTION.

Many of the passenger-carrying vehicles at the show were fitted either with giant pneumatic tyres or with very large twin pneumatics. The solid tyre on such vehicles was in the minority. The significance of its apparent supercession must not, however, be exaggerated. People select for exhibit vehicles which they believe to be of striking appearance and likely to attract special attention. The solid-tyred vehicle is seen every day upon the roads; the pneumatic-tyred

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MOTOR TRAFFIC

coach is a rarity in public. It is for this reason, and not on account of any very confirmed belief in the superiority of the pneumatic on large vehicles, that the exhibits were what they were. Tyre manufacturers are by no means unanimous in having great faith in the giant pneumatic. Vehicle manufacturers, having now had ample time to conduct tests, are somewhat lukewarm on the subject. We know the advantages of the pneumatic under comparatively light load, and are apt to assume that it must have the same advantages under heavy loads. It must be remembered, however, that we are not dealing with vehicles which travel at the speeds common to private motor cars. Also that the great weights carried involve the use of tyres with very thick walls capable of standing up almost like a solid, even when punctured, and for the sake of economy normally inflated to a very high pressure. It is only by using high pressures that the heavily weighted pneumatic can be given a reasonable expectation of life, or can be made to realise any advantage in tractive effort, and therefore in fuel economy. Under-inflation must mean constant distortions of the tyre walls, leading to rapid disintegration. At high speeds the superior comfort of the pneumatic would probably be marked, but at anything up to about twenty-five miles an hour it is hardly observable on a 3-ton vehicle. The same qualities which serve to give passengers additional comfort serve also to protect the vehicle mechanism from constant vibration. Thus under conditions which give little if any advantage to the pneumatic from the passenger's standpoint, there is probably equally little if any advantage to the mechanism. Consequently one cannot expect great saving in the repair bill. Again, since the shock transmitted in either direction must be equal, if there is no advantage to the passenger, there is probably no advantage to the road. So far as it is possible to arrive at any conclusion from existing data, the pneumatic does not at present appear to be very promising for useful loads of anything very much in excess of one ton, though it may find a place on the front wheels of rather heavier vehicles. There will also be more or less exceptional cases justifying the use, probably of twin pneumatics, on the rear wheels. These will probably be employed in increasing numbers on high class passenger-carrying vehicles of limited capacity.

LOADING AND UNLOADING.

A number of excellent examples of tipping bodies were shown at Olympia, but, though this is a step in the right direction, it represents only one facet of the many-sided problem of eliminating delays in loading and unloading. The tipping body simply provides a rapid means of unloading goods that can be roughly treated. The problem as a whole requires the provision of appliances to accelerate the handling of goods of all kinds, maybe perishable or breakable, when they are being put on as well as when they are being taken off the vehicle.

Mr. W. D. Williamson, of Walker Brothers, rendered a valuable service to motor manufacturers and users when he compiled the admirable paper which he recently read before the Institution of Automobile Engineers. In the first place he pointed out the money value of the time that can be saved by proper organisation and equipment for the purposes mentioned above. He showed quite clearly that the matter is well worth the consideration of every motor user, from the smallest to the largest. There are, as he tells us, three distinct ways of tackling the problem. We may provide interchangeable bodies for the vehicle, one body being available for loading or unloading while the chassis is on the road with another. We may equip the vehicle itself with some sort of mechanical device to help us in handling the goods quickly and safely. The tipping body is merely one section of this branch of the subject. We may alternatively or additionally provide a mechanical device at the loading depots, this being a plan which is more likely to commend itself to the larger users. It has the disadvantage that the device is only available at one place and cannot assist in saving time other than at one end of the journey. It has the advantage that the one device assists the loading and unloading of a number of vehicles, being applied to each in turn. Mr. Williamson did not specifically include trailers in his list of devices, though from the point of view of classification he was probably quite correct in omitting them on the grounds that they are in effect equivalent to interchangeable bodies.

When one goes into the subject, it is surprising how many devices have been proposed and used with at least some measure of success. There are, for example, several variations of the system of interchangeable bodies. Such bodies may be lifted off and lowered on to the chassis by overhead tackle. Alternatively, they may be placed on trestles and mounted upon rollers by the aid of which they can be readily run on to the chassis, there to be secured into position. Again, the interchangeable body may be made up of a number of boxes or compartments separately detachable. In this way small consignments can be dealt with separately and, when spare boxes are kept, these can be left at the points where loads are to be picked up, being loaded in advance and immediately slipped on to the vehicle when it arrives.

The mechanical devices that can be applied to the vehicle itself are very numerous. We may, for instance, have an overhead runway carrying a pulley gear. We may fit the lorry with a jib crane driven by the engine power when the vehicle is stationary. We may arrange the rear end of the vehicle body so that it can be moved vertically by mechanical means. The movable portion can then be lowered to ground level and heavy goods run on to it with the least possible expenditure of labour. Subsequently, the rear portion is lifted to the level of the rest of the body and the goods carried by it are pushed forward, leaving it ready to be again lowered for a new load. Yet another plan is to make the body capable of being tipped to the rear, providing a railed extension up which a wheeled truck can be drawn by means of a winch, the body then being brought back to its normal level and the truck secured in place. These are but a few of many plans that have gone beyond the experimental stage, but the fact remains that, considered generally, not sufficient attention has yet been devoted to this highly important problem.

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MOTOR TRAFFIC

COMMERCIAL MOTOR EXHIBITION.

SOME NOTABLE EXHIBITS AT OLYMPIA.

In our last monthly issue a general account was given of the opening of the 5th International Commercial Motor Exhibition, organised by the Society of Motor Manufacturers and Traders, which was held at Olympia, London, from October 14 to October 22. We now give descriptions of some of the more important exhibits, with illustrations of a number of the vehicles which attracted general attention.

Albion Motor Car Company, Limited (Scotstoun, Glasgow)—Five Albion machines were shown on this stand, three 20-H.P. chassis and two 32-H.P. chassis. The former included a bare chassis, a fifteen-seated motor coach, and a 25-cwt. box van. The larger machines were equipped, one with a 3½-ton tipping body, and the other with a pantechnicon to carry a net load of 72 cwts., excluding the weight of the body.

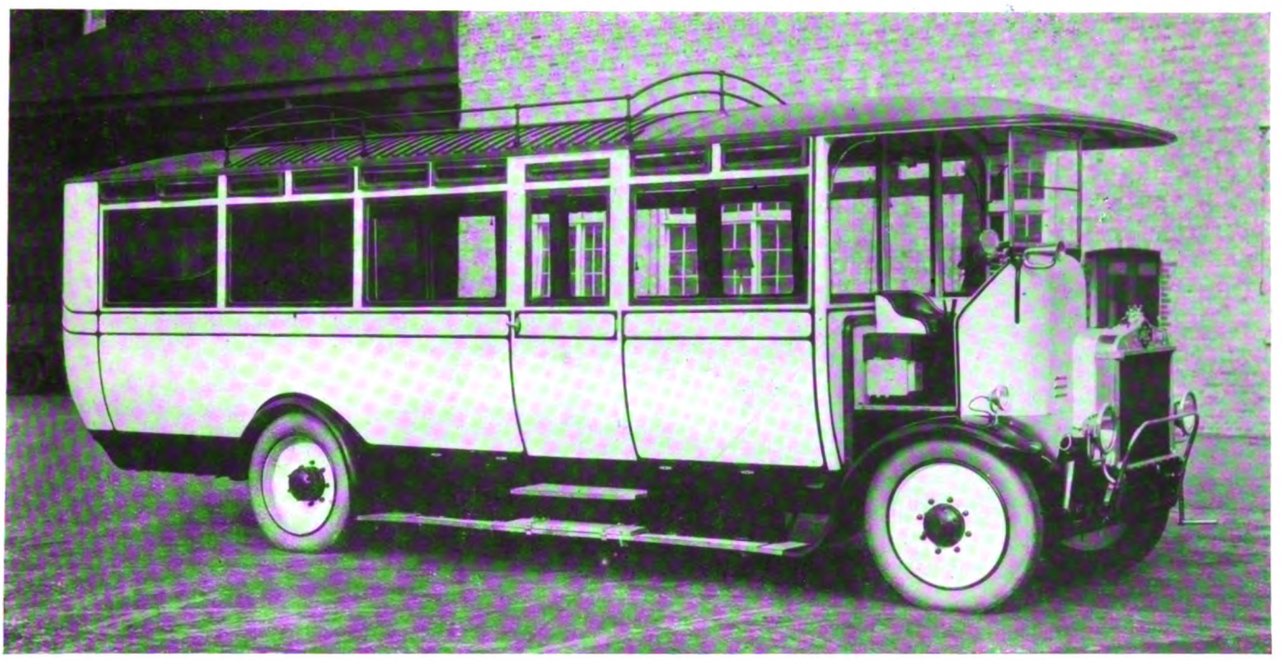
The 20-H.P. Albion chassis is built to carry a net load of 30 cwts. It is fitted with a four-cylinder engine (3½ in. × 5 in.) and has detachable cylinder heads. The lubrication is direct to each crank-shaft bearing. Two flexible joints are mounted between the engine and gear box, which is arranged for three forward speeds. The final drive is by overhead worm. Special attention has been paid to the brakes in the Albion design, two distinct systems having been incorporated. Immediately behind the gear box a drum is mounted, on which a powerful brake of the contracting shoe type is operated by means of a foot pedal, while hand-operated brakes of the internal expanding type are fixed to the rear wheels. These are compensated and easy of adjustment.

The motor coach is of the torpedo type, fitted with wind screen and cape cart hood. It is arranged to seat 14 passengers and the driver, and is luxuriously upholstered and mounted on Michelin pneumatic tyres. The engine is geared to 20 miles per hour. The box van is also fitted with pneumatic tyres to the front wheels, with twin solids on the rear wheels, and was designed to carry a net load of 25 cwts. The tipping body mounted on the 32-H.P. chassis was designed for a load of 3½ tons. It is built of steel plates, rigidly braced and strengthened, with internal dimensions of 10 ft. 4 in. × 6 ft. × 1 ft. 10 in. There is a roomy wooden cab for the driver. The hydraulic tipping gear, which is the Hele-Shaw single-ram type, enables the load to be tipped in 75 seconds. The 32-H.P. standard Albion chassis was also fitted to the pantechnicon, this model having a chain drive.

Associated Equipment Company Limited (Walthamstow).—The vehicles shown by the A.E.C. included a standard A.E.C. coach fitted with "Y" type scuttle dash and instrument board, and tapered bonnet, on solid Dunlop tyres, with accommodation for twenty-six passengers, and equipped with one door only in the front.

The most imposing of the A.E.C. exhibits was an "S" type limousine coach, fitted with arm chair seats, tables and silk blinds, high-class alabaster roof lights mounted in a shell-shaped roof picked out with walnut mouldings.

The majority of the windows drop down to the waist rail, and doors are fitted both sides. Small standard lamps are fitted on the card tables. Michelin pneumatic tyres are fitted—singles in front and twins at rear, and a spare wheel mounted in a receptacle at back.



A.E.C. Limousine Coach on an "S" type Chassis.

Luggage rail is provided on top and the roof is specially constructed to carry a ton of luggage. The well-known "S" type engine is fitted, equipped with two dynamos which light the internal part of the omnibus, together with two head lamps, two side lamps and one tail lamp. The seating is upholstered in leather, and a large oval window is at rear and mirrors are mounted on the wall. A speaking tube is provided between the driver and passengers, and the whole vehicle is finished in primrose yellow with black mouldings.

A further exhibit was an "S" type single-deck omnibus, suitable for municipal or country work, to seat forty passengers, fitted with dynamo lighting, mounted on "S" type chassis. This vehicle is upholstered in leather, great attention having been paid to the comfort of the passengers. The windows are halved in the centre to fall down, and electric light is provided throughout from two dynamos. The entrance is in the centre. An A.E.C. hydraulic tipping wagon was on view, fitted with "Y" type engine and improved A.E.C. hydraulic tipping gear. It has an all-steel body to carry four tons of road metal or other material. This vehicle will completely empty a load of four tons in thirty seconds, and return to its normal position in ten seconds.

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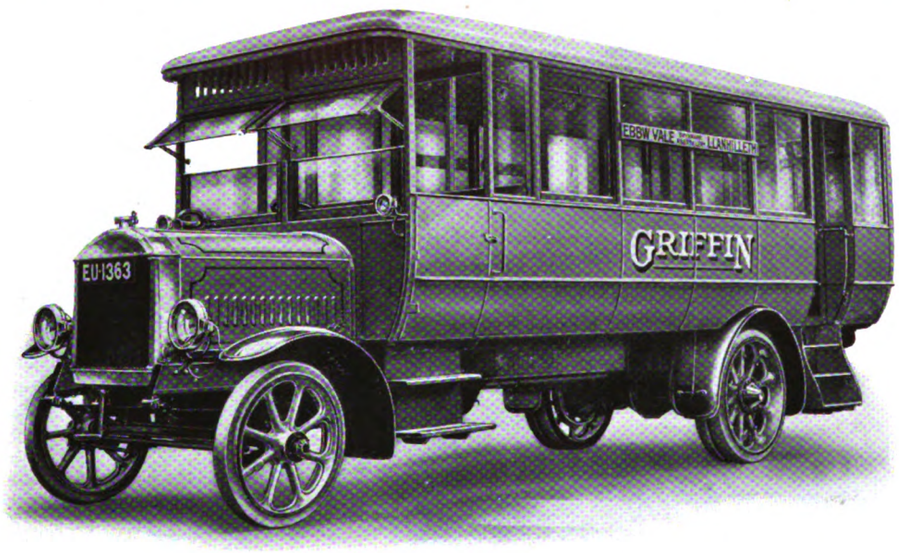
James Bartle and Company, Limited (Lancaster Road, Notting Hill, W.).—Bartle design and Bartle workmanship have now attained a very high standard. This fact was clearly demonstrated on their stand, where two types of passenger vehicles, an omnibus, and a motor coach were shown together with a commercial body and two examples of the new Bartle five-ton trailer. The former was the saloon omnibus known as the "Cheltenham" type, arranged to seat 30 passengers. Mounted on a Thornycroft chassis, this vehicle is admirably suited for public service work, having a large rear entrance. The seating accommodation is arranged for 20 on five pairs of garden seats facing forward in an inner compartment and 7 persons in the rear or smoking compartment. Provision is also made for 3 passengers beside the driver. Hinged ventilators at the front and rear give ample ventilation under ordinary circumstances, but extra ventilation can be obtained by removing the side windows entirely, as they are easily detached. The domed roof, together with rounded back corners, give the omnibus a refined and attractive appearance.

The Bartle all-steel trailer is a vehicle designed to withstand rough usage and to carry loads at all speeds. The main frame is manufactured out of pressed steel channel, with cross members, adequately positioned and rivetted. It has no whip or lag, and gives a maximum of strength and rigidity under all conditions. The fore carriage is pivotted on a bearing of large diameter. Lubrication is effected through the pivot being hollow and containing a quantity of oil which is distributed over the turning faces and the under thrust bearings. The wheel plates are recessed to contain a composition of graphite lubricant, and require little or no attention. The wheels are mounted on Skefko double-row ball bearings and run in oil. All wheels and hub parts are interchangeable. The springs are made of the best chrome vanadium steel of ample proportions. Brakes of the expanding motor type, fully compensated, are provided. These are lined with Ferodo, and operate on pressed steel drums, bolted to the hind wheels. They can be actuated from the lorry and independently, by a hand lever working in a rack on the trailer itself. The trailer is designed throughout with a high factor of safety, and can be fitted with any type of body.



Bartle "Cheltenham" Saloon Omnibus—To seat 30 Passengers.

John Buckingham, Limited (Bradford Street, Birmingham).—A single-deck omnibus and a standard type motor coach formed the exhibit of this firm of coach builders. The former was designed with front and rear entrances, both on the near side, and was arranged to accommodate 33 passengers, with a separate smoking compartment at the rear. The body was mounted on a Maudslay 32-H.P. chassis. The motor coach was mounted on a 35-H.P. Lancia chassis and was arranged to seat 18 passengers on five rows of seats. An improved type of hood was fitted, of light weight and easy to manipulate. Both vehicles were well constructed and of excellent finish.

H. G. Burford and Company, Limited (16, Regent Street, London, S.W.).—Three complete vehicles and a bare chassis, together with the 25-H.P. "Cletrac" tractor, comprised the exhibit on this stand. The bare chassis was the "Burford" 2/2½-ton standard model which has rendered such admirable service in various fields both at home and abroad that it is not surprising to find it possesses many friends. It is constructed on the unit principle, the power plant being mounted in the frame by a three-point suspension. The control mechanism is also assembled with this unit, and the whole can be removed clear from the transmission without disturbing any other part of the chassis. Pneumatic tyres, twin at back and single on the front wheels were fitted. Pneumatic tyres were also fitted to the 30-cwt. van, which had an exceptionally smart appearance.

The motor coach shown was mounted on a 2-ton chassis with frame and wheel base specially extended for this type of body, and fitted with brakes to act on all wheels. It was arranged to seat 22 passengers and constituted a very attractive exhibit. Two entrances, front and rear, are provided, with a gangway between, the seats being disposed on either side of the gangway and facing the engine. In addition to these, a row of five seats is placed at the back. All the seats are constructed on most comfortable lines, the whole of the interior being upholstered in real leather.

The tipping wagon, mounted on a 2½-ton chassis with shortened wheel base, was so designed as to enable it to run direct on to any standard weighbridge. It was furnished with solid tyres.

Caledon Motors, Limited (Duke Street, Glasgow).—Four exhibits, each of decided interest, were to be seen on this stand, the most noticeable being a single-deck omnibus which, it was claimed, provided seating accommodation for no less than 40 passengers. This was fitted with a 40-H.P. single-sleeve engine, a 4-speed "Dux" gear box, and a worm-driven live axle. The driver's seat in this model was arranged alongside the engine, as also in the chain-driven 7-ton chassis also shown. A bare chassis similar to that to which the omnibus body was fitted, and a 3-ton chassis fitted with a 32-H.P. engine were the other exhibits staged.

Carrosserie Latymer, Limited (Walmer Road, London, W.).—"Carrimore" trailers were the speciality shown by this firm, and in view of the importance of the question of cost of transport with which municipalities and all road authorities are faced, the well-designed examples on view were of considerable interest. Four complete trailers were staged, together with the standard all-steel trailer forecarriage. These included three 4-ton models of different types, and a 3-ton model complete with hinged detachable sides and tailboard.

The Bristol Tramways and Carriage Company, Limited (Tramways Centre, Bristol).—The outstanding feature on the Bristol Company's stand was their latest model saloon omnibus. This fine vehicle is arranged to accommodate 29 passengers, with every consideration for their comfort. It is fitted to the "Bristol" standard 40-H.P. chassis, which includes all the refinements that the wide experience of the company have found desirable in a passenger-carrying chassis. The engine develops 48-H.P. on the brake at 1,400 revolutions, so that ample power is provided for emergencies. The four cylinders are cast in pairs, 4½ in. bore × 5¾ in. stroke, the valves being all on the near side. A governor mounted in the cam shaft chain-wheel limits the speed of the engine, so that it is practically fool proof. Efficient lubrication is maintained by means of a pump driven off the cam shaft by spiral gear. The cooling system is on the thermo syphon principle, 3½ in. pipes being used throughout. The radiator, which has detachable headers, is spring mounted as a protection from road shocks. The gear box provides four speeds forward and one reverse and has a special type of gate enclosed in the box, one selector rod only being used. The main shaft is coupled to clutch shaft by laminated steel universal. A mileage recorder drive is provided in the box and bolted to the chassis frame. All shafts are carried on ball bearings. The

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whole of the driving mechanism in the back axle, which is of the overhead worm type, is a self-contained unit and is removable without disturbing the road wheels. Two distinct brakes are provided, the hand brake operating on large pressed-steel drums attached to the rear wheels, and the pedal brake on a drum mounted on the main shaft immediately behind the gear box. Steering is performed by means of a worm and quadrant, and the quadrant shaft is mounted on eccentric bushes for wear adjustment. A dynamo for lighting the vehicle is fitted high up under the bonnet, with a drive from the engine. This has an output of 10 amperes at 12 volts with automatic voltage regulation. The accumulators have a capacity of 75 ampere-hours and are capable of lighting the two head lamps and tail light on the chassis, and also the four lamps in the interior of the vehicle. Eighteen-candle-power lamps are used throughout. The chassis dimensions are—Wheel base, 14 ft. 6 in.; overall length, 22 ft. 10 in., width 18 ft. 6 in. from dash to end of frame. It is worthy of note that the engine is manufactured entirely in the company's works at Bristol, and is exclusive to the "Bristol" commercial vehicles. It has proved remarkably efficient and economical under most exacting road conditions.

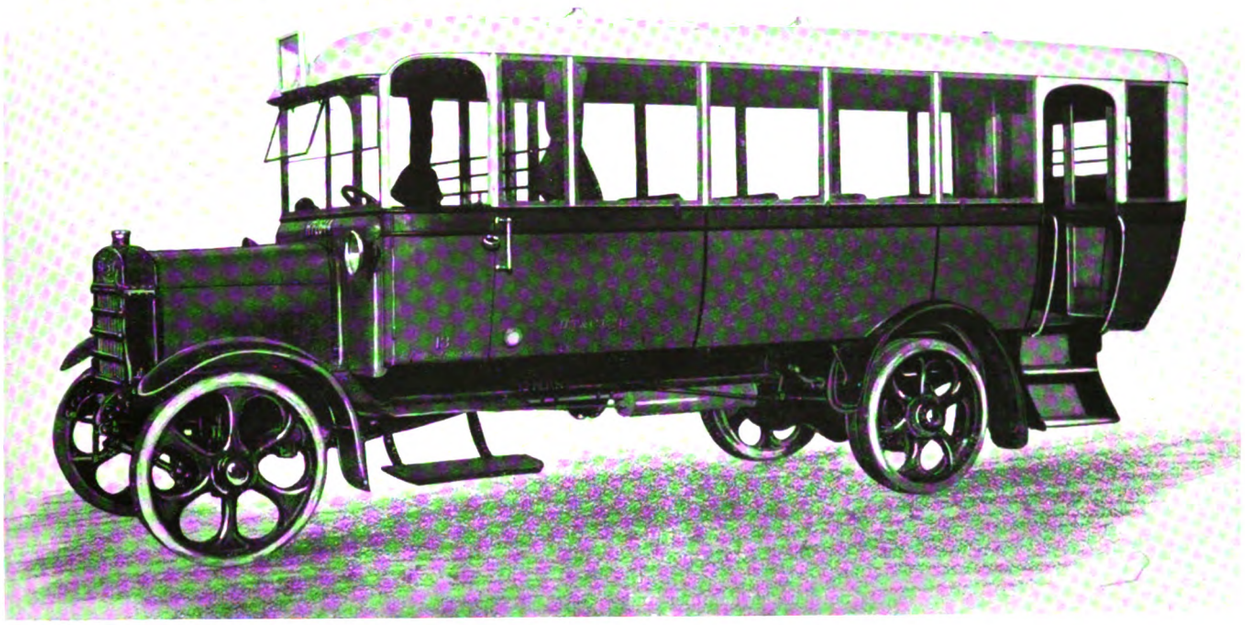
A bare chassis of the same type was also shown, as well as the engine with the base removed, while the gear box and change-speed units with electric motor drive demonstrated the method of changing gear. A complete inspection of the details of the chassis could therefore be made.

Clarkson Steam Motors (Moulsham Works, Chelmsford).—The staging of two 3-ton steam chassis constructed to run on coke fuel was well calculated to attract the attention of all interested in economy in motor traction. Mr. Clarkson's faith in the practicability of his system would certainly appear to be well justified by the figures which we now publish as the operating costs. Although the two chassis shown were designed for use with coke fuel, they are adaptable for oil fuel or charcoal. The chassis has a pressed-steel frame with chrome vanadium springs, Daimler type worm gearing, with a one-piece back axle casing. The wheels run on Timken roller bearings, and all that is best in modern motor practice has been incorporated in the chassis. It is, however, in the power unit that the interest lies. This consists of the Clarkson patent thimble-tube boiler, equipped with automatic water and draught control, the working pressure of which is 300 lbs. per sq. in., and a two-cylinder compound Vee engine with fixed cut-off. Space will not permit a full description of this equipment, but it may be stated that with the positive action lubrication for both cylinders and the moving parts generally, coupled with the automatic control already referred to, Mr. Clarkson can reasonably claim to have made a modern application of the principle of steam, combined with the simplicity and efficiency of the petrol motor. The figures showing the operating costs of Clarkson 3-ton lorry under three typical conditions of weekly mileage speak for themselves. They are as follows—

	Miles per week—Pence per mile.		
	600	400	200
	d.	d.	d.
Driver @ £4	1·60	2·40	4·80
Mate @ £2 10s.	1·00	1·50	3·00
Coke @ £2 per ton	1·00	1·20	1·50
Maintenance of Chassis	0·50	0·50	0·50
Tyres	0·60	0·60	0·60
Lubrication	0·18	0·18	0·18
Interest, £1,050 @ 6½ per cent.	0·55	0·81	1·62
Depreciation taken on a 10 years' life and allowing 20 per cent. for then value...	0·65	0·98	1·96
Insurance @ £20	0·16	0·24	0·48
	6·24	8·41	14·64

Commercial Cars, Limited (Luton).—A wide range of usefulness was covered by the four exhibits of "Commer Cars." These included the "2G" type two-ton net load bare chassis; the "C.C." type five-ton net load bare chassis; the "R.C." type 3¼ ton chassis, fitted with a tipping body; and the "3P." type passenger chassis, fitted with 30-seated motor coach. The two-ton model is a distinctly interesting proposition in view of the growing tendency for smaller passenger-carrying vehicles. The engine is of the "Commer" four-cylinder type, 100 mm. bore × 120 mm. stroke, 25-H.P. with Thermo-syphon cooling system and automatic lubrication. The gear box gives three speeds forward and a reverse with gate change. There is a full floating back axle with worm drive. Two brakes, one acting on main shaft and the other on back wheels are fitted. The wheel base on the standard frame is 11 ft., but for passenger work this is a foot longer, when the length behind the dash is 14 ft. 1 in.

The "3P" type chassis is specially designed for passenger work, is fitted with a 40-H.P. engine, and in the main is similar to the two-ton model. The motor coach body shown on this chassis was constructed at the company's works at Luton, and embraced a number of features conducive to the comfort and convenience of passengers. It was arranged to seat 30 passengers in six rows of five, including the driver, and visitors could not but feel that ample space had been provided for free movement even when loaded to



Bristol Saloon Omnibus Seating 29 Passengers

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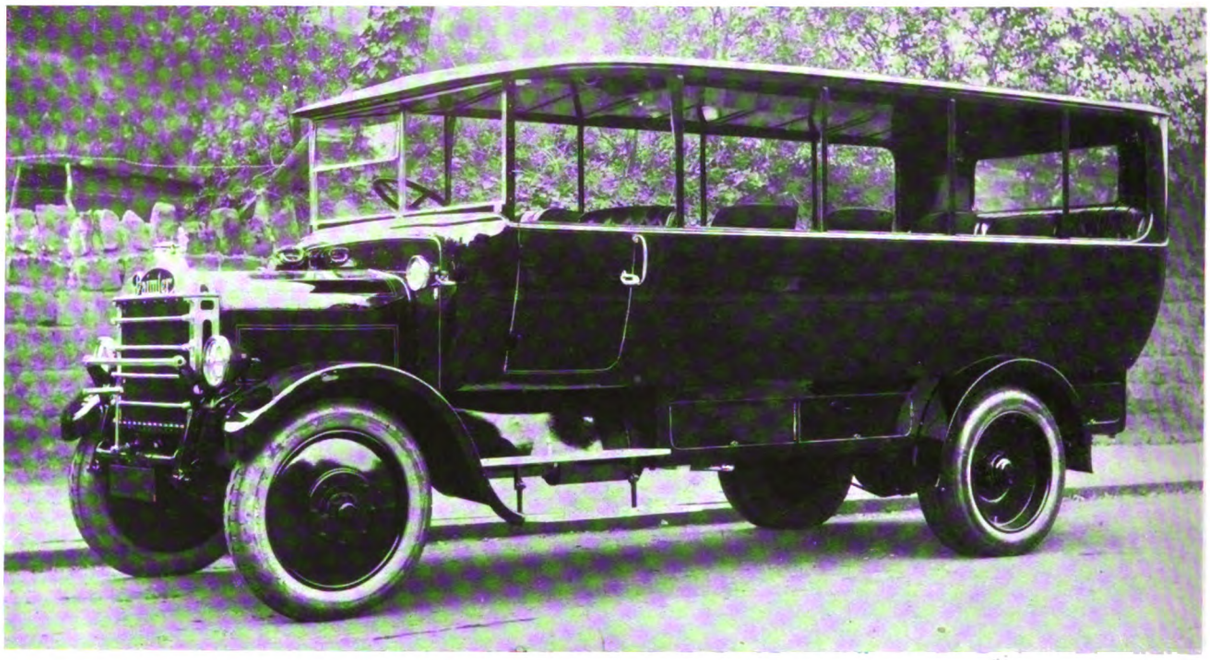
full capacity. The seats were large and deep, soundly upholstered and well sprung.

The 3-way tipping body mounted on the 3½-ton chassis was also constructed at Luton. It is hydraulically operated by means of an oil pump placed on the near side of the gear box. This pump is driven by means of a friction wheel in contact with the flywheel. An important feature in connection with this tipping device is the smooth working and the impossibility of bumping owing to the provision of leak valves.

The 5-ton chassis has a chain drive as well as the 3½-ton model; each of the others have the full floating axle and worm drive.

Daimler Company, Limited (Coventry).—Four complete Daimler commercial vehicles were exhibited on the Daimler Company's stand. These consisted of two passenger-carrying vehicles—a motor coach, a char-a-bancs, and two tipping lorries. A sectioned chassis was also shown The Daimler motor coach illustrates the rapid advances made in the design and equipment of this type of vehicle. It provides complete protection in all weathers, with the maximum comfort for the passengers both under summer and winter travelling conditions. It is fitted with Mechelin twin pneumatic tyres 955 mm. × 155 mm., and disc wheels, all of which are interchangeable. Swivel bucket type seats provide accommodation for twenty persons, exclusive of the driver.

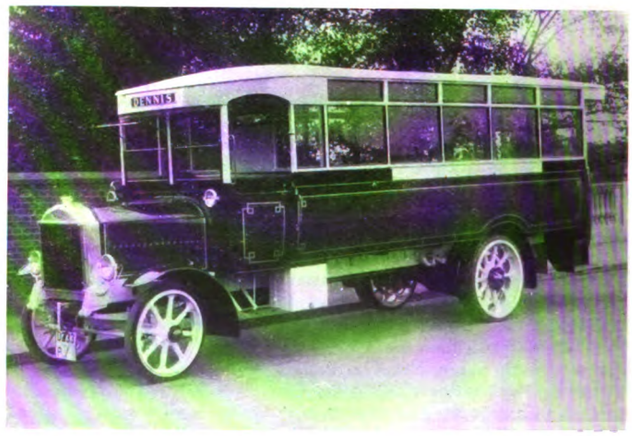


Daimler all-weather Motor Coach.

The second passenger-carrying machine was a twenty-seated char-a-bancs, the body of which was built by Buckinghams Limited, Birmingham. This machine is fitted with Dunlop 955 mm. × 155 mm. pneumatic tyres (twin on rear wheels). Both of these passenger-carrying vehicles were exhibited complete with full equipment ready for the road. The tipping lorries are on the C.J. type chassis. The one with hydraulic tipping gear has an all-steel end-tipping body with a carrying capacity of 2½ cubic yards. The second tipping lorry has a body with hoisting gear supplied and fitted by the Eagle Engineering Company, Warwick. This is a duplicate of the machines recently supplied to the Cleansing Department of the City of Westminster Council

The sectioned chassis attracted attention, for it showed clearly the clean design and substantial construction of the working parts upon which the efficiency and long life of a chassis depends. The engine was sectioned to show the important working parts. Through the front cylinder, the piston and sleeve valves were seen, and the timing of the valves could be clearly followed as the engine was slowly revolved by an electric motor. Through large openings in the crank case, the lubrication system could be seen. The gear box lid had been removed to show the substantial and simple gear box arrangement, and with a section removed from the rear axle casing, the Daimler-Lanchester worm gearing could be inspected. Goodyear giant pneumatic tyres were fitted, together with a tyre pump driven from the gear box.

Dennis Brothers, Limited (Guildford).—The display on this stand, both in number of exhibits and the variety of their uses, was well worthy of the attention they received from the discriminating buyer. Most prominent was a well-finished sample of the new light weight single-deck omnibus, which appears to be rapidly finding favour with provincial authorities. This has seating accomodation for thirty-six passengers, and was mounted on the Dennis standard 40-H.P. chassis, which has earned for itself a high reputation for passenger service. The engine has four cylinders cast in pairs, with bore and stroke of 115 mm. × 150 mm., the 40-H.P. being developed at 1,000 revs. The inlets and exhaust valves are arranged on opposite sides. Accessibility is a strong feature of the Dennis design. The engine and gear box are carried on a sub-frame



Dennis 36-seater Omnibus.

which pivots on the front cross member, and is attached to the side members at two points on either side by brackets. The lower half of the crank case is removable without disturbing the working parts of the engine, while in the case of the back axle, the top casing

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together with the driving mechanism can be removed without removing the wheels or axle. It is also possible to withdraw the live axles without disturbing the wheels. The gear box gives four speeds and reverse; the final drive is by overhead worm, the evolution of which will always be associated with the name of Dennis. The handsome motor coach, arranged to seat thirty passengers, was mounted on a similar chassis, except in this case the wheel base was shorter—14 ft. 1½ in., whereas the omnibus chassis is 15 ft. 4 in. The Dennis 30-H.P. 2-ton chassis is similar in many respects to the larger model; the engine and gear box, however, are each carried separately, the former on its own sub-frame and the latter by cross members. An example of the 40-H.P. long

Dodson's Convertible Omnibus Seating 32 Passengers.

omnibus chassis was shown separately and this, fitted with solid tyres, single in front and twin behind, was priced complete at £950.

A new model fire engine, to meet the requirements of urban districts and other comparatively small communities was also included. This was fitted with a 30-H.P. engine and had a capacity of 200/250 gallons. It had the Dennis turbine motor pump.

De Dion Bouton, Limited (Great Marlborough Street, W.)—An excellent display was made of the three standard De Dion models. The exhibits included a bare 20-H.P. chassis; the same chassis fitted with a platform lorry; a 25-H.P. chassis, and a 30-H.P. chassis, specially designed for motor coach work. Each of these models embraces the standard practice of this well-known French firm, the most notable feature of which is the final drive. The load of the back axle is taken by a solid member, terminating in journals upon which the rear wheels are carried. The casing containing the driving mechanism is suspended from a cross member at the rear end and from the torque tube at the forward end. Each of the road wheels is connected to an internal pinion which engages a toothed rack by means of short shafts universally jointed. The whole of this mechanism, including the propellor shaft, is enclosed.

Christopher Dodson, Limited (Cobbold Road, Willesden, London, N.W.).—The "Charabus" body shown on this stand proved to be one of the most attractive features of the exhibition. Dodson's reputation for high-class body work may well have been considerably enhanced by this demonstration of the possibilities of combining the best features of the popular motor coach with the comfort and protection of the motor omnibus in bad weather. As our illustration shows, the vehicle was primarily designed as a motor omnibus with all the refinements which a long experience of public requirements has suggested. The normal seating arrangements provide for thirty-two passengers, but by fitting automatic tip-up seats in the central gangway and one behind the rear door, forty-two passengers can be accommodated. The body is electrically lit, a C.A.V. lighting set being installed. To convert the omnibus to an open motor coach the windows are entirely removed—a rattle-proof receptacle is provided for them under the body—the hinged window pillars are folded flush with the body and each side of the roof hood is folded back longitudinally into a centre beam which connects the front glazed partition to a fixed canopy at the rear. The complete change can be made in a few minutes by the driver and conductor, but if the vehicle is travelling as an open coach and protection is required for a passing shower, the roof hood can be drawn out and locked in position instantly. In this case, storm curtains can take the place of the windows, these being fastened by means of buttons. As the interior lights are attached to the centre beam, the changeover in the character of the vehicle in no way disturbs the lighting system. The interior of the vehicle is exceptionally well arranged, and as the side panels are low a free view is obtainable under all conditions. As an "all weather" coach it leaves little to be desired. The "Charabus" was mounted upon a Leyland G. 7 chassis.

The second exhibit on the Dodson stand was a standard 29-seated single-deck omnibus mounted on a Tilling-Stevens chassis.

W. & G. Du Cros, Limited (Acton Vale, London).—A vehicle of considerable interest and of novel design was shown on this stand. It has been named the W. & G. "Way Tip" lorry, and not only is it possible for a load of one or two tons to be tipped at any desired spot, but the accurate weight of the load can be ascertained by reference to the calibrated gauge which is fitted to the tipping gear. As will be seen from the illustration the body consists of two self-contained steel compartments with doors hinged at the top. These are mounted on the frame in such a manner that they are normally held in position by four clips (two at each side). These clips, however, can instantly be released as desired, thus leaving each section of the body free to respond to the movement of the tipping gear.

The hydraulically-operated ram or jack has a double-acting pump and is a self-contained unit, the one jack being used to weigh and tip either compartment, as required. In order to do this the jack is mounted on a movable carriage which runs along channel rails into the required position, which is determined by depressions in the rails into which the rollers of the carriage drop. The chassis is the W. & G. standard 2-ton model with certain modifications, which consist mainly of shortening the frame and wheel base in order to give greater facility for operating the vehicle in confined areas.

The standard 2-ton chassis was also shown. This has a four-cylinder engine of 25-H.P. at 1,000 revolutions, and is designed to

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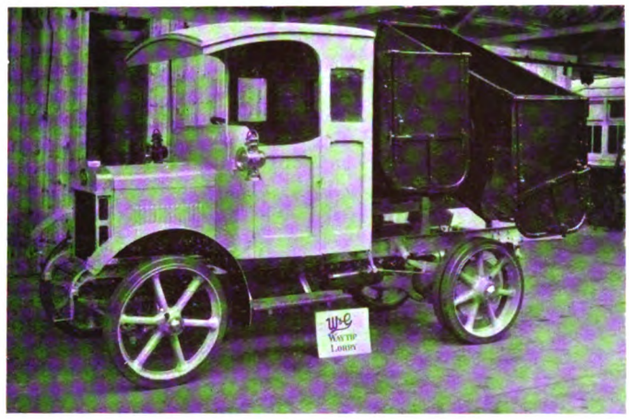
carry a gross load of 2¾ tons. A three-purpose machine, designed for use either as an ordinary lorry, a tipping wagon or a thirty-seater passenger vehicle, attracted much attention. This was fitted to a chassis designed to carry a gross load of 3¼ tons.



W. & G. "Way Tip" Lorry.

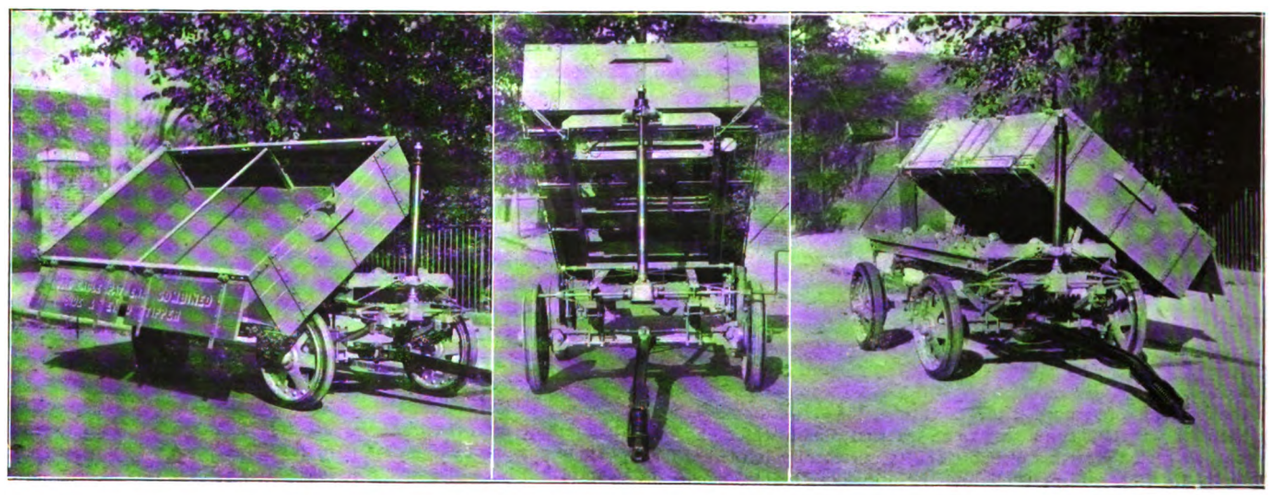
The Eagle Engineering Company, Limited (Eagle Works, Warwick).—The main exhibit on this stand was the Eagle patent combined side and end-tipping trailer wagon. This type of wagon, fitted as a side tipper, has been supplied to users all over the world and is in general use by most of the county councils throughout this country. The Eagle trailer is an all-steel vehicle built upon motor lorry lines, and is designed for efficient traction at high speeds over all conditions of roads, without undue vibration. Although large diameter wheels are used, the loading height is remarkably low. This is made possible by the Ackermann system of steering, by which the ordinary form of fore-carriage is entirely dispensed with. Ackermann steering is effected by means of a jointed continuation of the draw-bar from the axle centre coupled to the axle stubs, with the usual adjustable rods and arms.

The trailer here illustrated is the 4-ton low-loading type chassis, fitted with pressed-steel wheels and solid rubber tyres and equipped with the "Eagle" patent combination side and end-tipping wagon body. This is hand operated, and the vertical telescopic tipping screw gear is an entirely new device which, in combination with the standard practice for side-tipping, meets all requirements for this type of machine. The tipping gear consists of two horizontal screws which propel the body sideways by means of steel arms until it reaches the locating stops. By this means the body is practically in a balanced position before it commences to tip, causing no undue strain on the vehicle. The screws and rollers are contained in an independent steel sub-frame which is pivoted toward the rear end of trailer and the front end is connected to a vertical telescopic screw. For end-tipping, the whole of the side-tip mechanism and the sub-frame is elevated by the vertical screw which is, of course, operated quite independently of the other parts. Either side or end-tipping are distinct operations and do not depend on one another. The body can therefore be tipped either sideways or endways without alterations. A noteworthy point is that the load is tipped well clear of the body.

Fodens, Limited (Sandbach, Cheshire).—Two 5-ton rubber-tyred steam motor wagons and the new model "Foden" steam tractor formed the exhibit on this stand. One of the wagons was fitted with a standard lorry platform body, and the other with an end-tipping body, operated by hydraulic gear, built to the order of the Essex County Council. Each of these machines embodies the latest Foden refinements, including the feed-water pump, driven by friction gear from the engine and the roller bearing eccentrics. The hydraulic ram in the tipping wagon is operated by the pressure obtained from the feed-water pump. The main attraction to the stand was undoubtedly the new tractor which has a haulage capacity of from 8 to 10 tons. Broadly speaking, the well-known lines of the steam wagon have been followed in the design of this vehicle. The compound engine has a working pressure of 200 lbs. to the square inch and is fitted with double high-pressure valve. The drive is taken through the 2-speed transmission by a single roller chain to the back axle, which is of the "Foden" standard type. Large rubber-tyred wheels are provided, and a water-ballast tank gives considerable flexibility with regard to tare weight. A winding drum is carried on the rear axle.

Richard Garrett and Sons, Limited (Leaston), Central House, Kingsway, W.C.).—The five exhibits on this stand were of a varied character, embracing both steam and electric vehicles. The Garrett 2½-ton electric chassis was fitted with a lorry body. The single electric motor is of the series wound type and of a most efficient design, capable of an overload of 300 per cent. for a short period. Silent roller chains provide the final drive. The Garrett patent control gear is worthy of special mention as with this the controller is automatically returned to the "off" position whenever the brakes are applied.

Two steam vehicles were shown, the five-ton steam wagon and the Garrett No. 4 steam tractor. The wagon follows the usual overtype practice, and is fitted with a low-sided body with solid rubber tyres. The engine works at a pressure of 200 lbs. and has the link motion and balanced cranks identified with the Garrett design.



The "Eagle" Three-way Tipping Trailer.

The tractor, which had its large wheels fitted with Macintosh rubber tyres (single 160 × 870 mm. on the front and twin 1·530 × 140 mm. on the back) has a working steam pressure of 180 lb. per sq. in. It is a three-shaft machine, giving two driving speeds. A six-ton trailer and a sleeping van for workmen completed the exhibit.

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Four Wheel Drive Lorry Company, Limited (Kingsway, London, W.C.).—One of the most interesting exhibits in the exhibition was staged on this stand. This consisted of a 4-wheel drive lorry fitted with a 3-way hydraulic tipping body and a trailer equipped in a similar way, both vehicles being operated by the driver from his seat. The general arrangement will be seen from the illustration which we give of the two vehicles coupled for use as a single unit. The claim for economy that is the outstanding feature of the 4-wheel drive system is based upon the efficient utilisation of power, and an inspection of the machines shown at Olympia certainly supports this claim. The device which brings the driving force to each wheel is the patented centre differential. From this point power is fed in either direction as necessity demands. The power is transmitted through propeller shafts, bevel gear drive, and full floating axles, directly to the four wheels. A strong point in favour of this system is that it can be operated under all conditions, even where there are no roads at all. It can be used for every kind of haulage, either as a 3-ton lorry or in conjunction with a trailer for loads up to eight tons, and this, according to the claim of the makers, at less cost than any other lorry of similar capacity. An important feature of the system was demonstrated on the bare chassis (which was also shown), by each of the four wheels being fitted with single pneumatic tyres. As the drive is equal on all wheels, it is quite unnecessary for twin tyres to be fitted. It will be noticed from the illustration that the driver's seat is placed beside the engine, thus giving a long body space on a short wheel base. In like manner, the rear axle with complete shaft system and brakes forms another unit, the advantage of this system being that each unit can be taken out and quickly replaced with a spare in case of accident, and the vehicle kept in service without unnecessary delay. We hope, in a subsequent issue, to give some further details of this noteworthy machine.

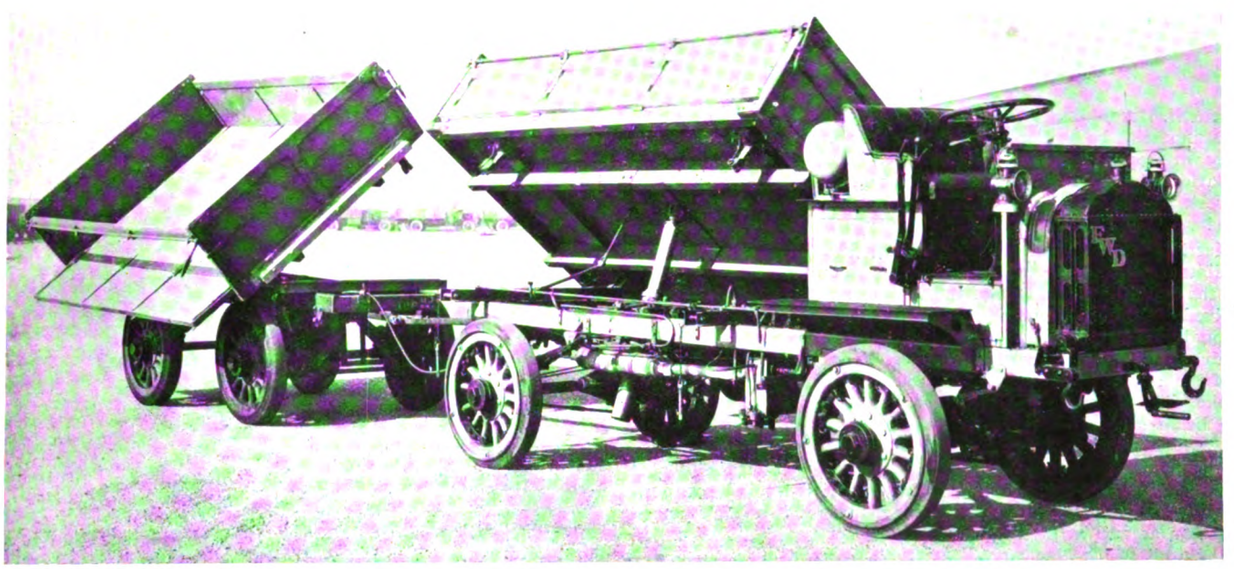
General Vehicle Company, Limited (43 Shoe Lane, Holborn, E.C.).—Three standard models (2-ton, 3½-ton and 5-ton) of the G. V. electric chassis were presented on this stand. These provided excellent examples of the Exide Ironclad battery vehicles, which are doing good service in municipal and other fields of usefulness where their reliability and low cost of maintenance are much appreciated. The 2-ton model was fitted with a "Constable" patent end-tipping body, specially designed for house refuse collection, with a capacity of six cubic yards. The tipping gear is electrically operated, a full load being tipped in 60 seconds. The 3½-ton model was fitted as a brewers' dray, and is one of a large fleet built for Messrs. Whitbread's brewery. The 5-ton model was fitted with a 3-way steel tipping body suitable for coal, road material, etc. The tipping mechanism is electrically operated and controlled from the driver's cab. The motors installed in the G. V. chassis are of the enclosed series wound type, taking an overload of 300 per cent.

Guy Motors, Limited (Falling's Park, Wolverhampton).—The exhibit of this firm consisted of six items, including an entirely new model in the form of a 2/2½-ton electric vehicle which was shown to the public for the first time. It was fitted with a hand-tipping body, with a low loading line, due to the underslung springs of the chassis. In appearance this machine is very similar to the standard Guy petrol chassis; indeed, many of the features are common to both. The electric motor, of the series type made by Vickers, Limited, is of 6-H.P. nominal with guaranteed overload of 300 per cent. for a short period. This is placed in the front of the chassis, the transmission being by propeller shaft to a double-reduction back axle. Exide Ironclad batteries are used.

The 25-cwt. petrol chassis shown was also a new model and is one that seems likely to add to the high reputation already established by the Guy machines. Other noticeable exhibits were the handsome passenger coaches, each mounted on the Guy 2½-ton chassis. These were fine examples of their kind and should find a ready market both for touring and regular passenger services. The touring coach was arranged to seat 20 passengers, and apart from the handsome appointments was noteworthy on account of the roominess and comfort of the seats. In the saloon coach 21 seats are provided for passengers, and the driver is partitioned off by a glass screen. The entrance is in the front of the vehicle by the side of the driver. Electric light is provided for the interior as well as for the driving lamps. A double-purpose machine mounted on a long wheel base 2-ton chassis was also shown. This had a platform lorry body on which was mounted a 24-seated coach body. As the coach body is fitted with rollers which run on the platform beneath the passenger body can easily be removed when the vehicle is required for use as a lorry. A point worthy of mention is the neatness of the whole design, for when the passenger body is in position there is nothing to indicate the vehicle's changeability. The movable body is secured in position by six bolts, three on each side.

J. & E. Hall, Limited (Dartford, Kent).—The "Hallford" chain-driven chassis, ranging from the 2½-ton 25-H.P. machine up to the sturdy 5-ton tipping wagon was staged on this stand. The five exhibits each gave evidence of the ample proportions allowed for in the Hallford design. The 2½-tonner was fitted with a lorry body with fixed cover; a 3-ton chassis furnished with a 32-H.P. engine and a 4-speed gear box, had a long wheel base which rendered it specially suitable for passenger services. It was fitted with a low-sided platform body designed to take a pantechnicon lift body.

The 4-ton standard Hallford chassis is also fitted with a 32-H.P. engine. This has a wheel base of 13 ft. 6 in. It was shown stripped and also fitted with a special brewer's type of lorry body. A



Four Wheel Drive Lorry and Trailer, Hydraulic Tipping fitted to each.

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mechanically-operated tipping wagon was mounted on the 5-ton Hallford standard chassis. This is fitted with a 40-H.P. engine, and in every respect appeared to be well suited for the strenuous work for which it was designed. All the Hallford models are fitted with aluminium chain cases.

Halley's Industrial Motors, Limited (Yoker, Glasgow).—This well-known Scotch firm showed two passenger vehicles—a thirty-one seated omnibus, upholstered in leather spring cushions fitted to a new overtype 6-cylinder chassis, and a thirty-seated motor coach of handsome appearance and equipped with pneumatic tyres. The Halley 35-H.P. 6-cylinder engine (3½ in. × 6 in.) is meeting with general favour on account of its high maximum speed with low fuel cost. It is particularly suited for passenger work by reason of its flexibility. The cylinders are cast in blocks of three and are fitted with detachable heads to facilitate the cleaning of the pistons. Three-point suspension is adopted. The lubrication is by forced feed, and a noteworthy point is that there are no external oil pipes. The few pipes that are necessary are contained inside the engine, where a special design of gutters and troughs ensures ample lubrication of all parts. The transmission is by carden shaft, with patent universal joints, mechanically centred and specially lubricated, and by overhead worm to back axle. The gear box is of aluminium, suspended by three points on the tubular cross-members. Four speeds and a reverse are provided for, the shafts being mounted on adjustable roller bearings

Other exhibits were a 750-gallon vacuum gulley-emptying tank, complete with the necessary equipment, and a 45-H.P. 6-ton chassis fitted with chain drive.

Halley's six-cylinder Motor Coach.

E. & H. Hora, Limited (Peckham Road, London).—Three examples of commercial bodies were shown by this firm. A pantechnicon body with separate driver's cab, mounted on A.E.C. 45-H.P. chassis ; a platform lorry with detachable sides and tailboard, and enclosed driver's cab mounted on a Burford 2½-ton chassis, and an open-sided van body, mounted on a Karrier type K. 4 chassis.

Karrier Motors, Limited (70, Victoria Street, S.W.).—The four exhibits shown on this stand gave visitors an opportunity of inspecting the various applications of the very fine chassis which has been evolved from the experience obtained by Messrs. Karrier with their original W.D.S. model. The K 4, as the improved model is called, retains many of the earlier features. The new 50-H.P. engine is of the 4-cylinder type, cylinders cast in pairs, bore 5 in. × 6 in. stroke. This is suspended in the chassis at three points, the front end being supported by a substantial cross member. The gear box, which provides for four speeds forward and a reverse is also supported by cross members. The back axle is of the double reduction type. Timkin roller bearings are fitted to the counter-shaft bearings. A specimen of the chassis was shown in a stripped condition as well as fitted with three distinct types of bodies. In the exhibits of the long lorry body, the driver was placed over the engine in order to obtain an extra long platform loading space without increasing the length of the wheel base. A well-designed cab affords ample protection for the driver.

A special type of motor coach was also mounted on a similar chassis. This was arranged to seat 30 passengers, and was fitted with the Karrier patent one-man hood. The 3-way hydraulic tipping wagon mounted on a like chassis was of special interest. The pump in this model was operated by a friction wheel, engaging the flywheel of the engine. The two ball-jointed rams which operate the body are placed in the centre of the chassis, and the direction of the tip is regulated by the removal of two holding bolts from the opposite side to that on which the load is required to be tipped.

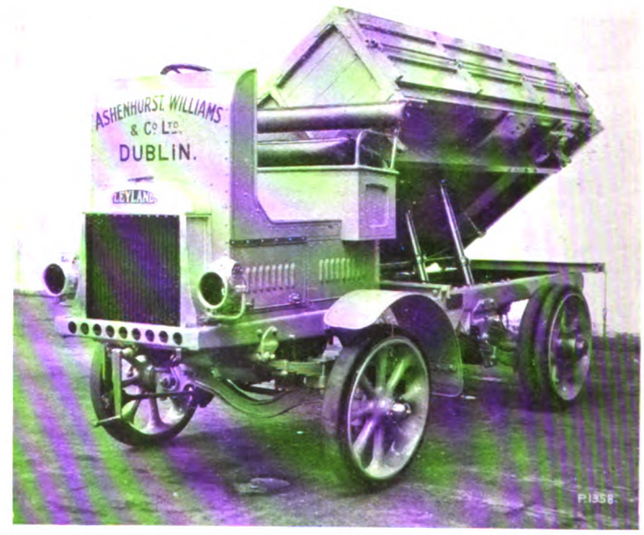
The Karrier combined sprinkler, road-sweeper and refuse collector was also shown. As the comprehensive title suggests, this machine is designed to complete the whole of the road cleaning work at one operation. It should rapidly find favour as a labour-saving device with municipal authorities, contractors and others responsible for this class of work.

Leyland Motors, Limited (Leyland, Lancashire).—The Leyland exhibit included a standard rear entrance single-deck omnibus of the Edinburgh type, a motor coach, a 3-way tipping wagon and the new Leyland light type motor fire pump. The 3-way tipping wagon is a new model and has been designed for use in restricted areas where a larger machine could not be operated. It has a short frame, the wheel base being only 8 ft. 6 in., and the driver is placed

Leyland "Edinburgh" type Omnibus.

immediately above the engine which is the Leyland 30-H.P. type. A plate clutch is provided with a single reduction worm-driven back axle. The 3-way tipping body is operated by the Bromilow and Edward's hydraulic gear, the pump for which is driven from the engine.

The 250-gallon fire engine is also a new model, and has been specially designed to meet the demand for such a machine, on the part of small townships, district councils and urban authorities



Leyland Short-wheel base Tipping Wagon.

where the large machines are unsuitable on account of inadequate water supply. This machine is fitted with a 36-H.P. engine, worm-driven back axle, and the usual fire-fighting appliances. The single-deck omnibus shown is exactly similar to a number supplied to the

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Edinburgh Corporation. It is arranged with two compartments, the rear being for the use of smokers. The chassis is the Leyland G. 7 chassis with a 40/50-H.P. engine, the final drive being of the worm type. The handsome motor coach was mounted on the Leyland 30-H.P. chassis, with worm-driven back axle. This had removable disc wheels and Michelin pneumatic tyres.

An exhibit which received notable attention throughout the show was a working model of the Bromilow and Edward's tipping gear. This was kept in constant operation by means of a small electric motor.

Laffly (England) Company (14 Addison Avenue, London, W.)—Interest naturally centred upon the luxurious saloon coach which recently figured in the 1,400 mile tour through England and Scotland, and which formed the outstanding figure on this stand. The fact that the chassis which had carried the handsome vehicle and its passengers so successfully through this severe test was the standard 5-ton Laffly-Schneider type, as fitted to ordinary commercial vehicles came as a surprise to a large number of visitors. In order that a close inspection could be made of the chassis, a 5-ton tipping wagon, with the body tipped, was shown mounted on a standard chassis. From this it was seen that the main frame is of robust construction, being built up throughout of rolled steel members. The powerful 4-cylinder engine is mounted on a rolled-steel underframe of channel section. As stated in a previous issue, the gear box fitted to the chassis now in this country gives three speeds only. In subsequent deliveries from the world-famous Creusot Works, however, a 4-speed gear box will be fitted.

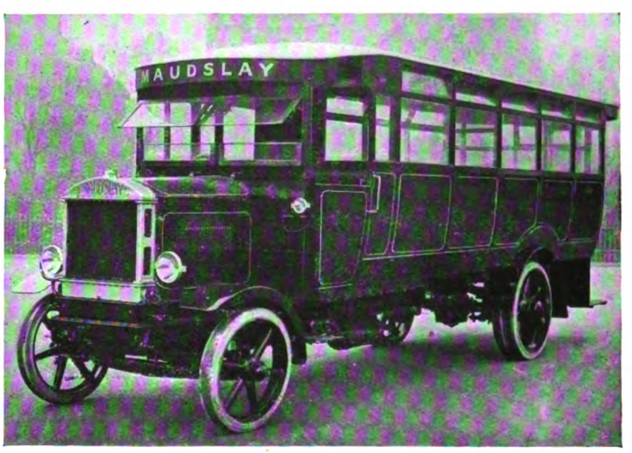
Two other machines were staged, each of special interest to municipal authorities, one being the motor street sweeper, a description of which appeared in a recent issue of the TRAMWAY AND RAILWAY WORLD, and the other, a new-comer to this country, the Laffly motor roller. Although new over here, it is very well-known on the Continent, and during the war established a great reputation for its efficiency in the hands of British soldiers when re-making roads in devastated areas. In general design these rollers follow the practice of the old steam roller, inasmuch as the back rollers are set outside the track of the front rollers, thus covering a much wider area at each operation. Another important point is the fact that the rollers themselves are made of cast steel and are therefore practically indestructible. All the working parts are of case-hardened steel, tempered to the requisite degree. The driving mechanism (the motor change-speed gear and reverse mechanism, pump, etc.), are mounted on a strong cast-steel framing, quite independent of the other parts of the machine. The gear box is absolutely tight, and the two-speed gear and reverse motion mechanism is so arranged that the machine runs at the same speed in either direction. The gears are always in mesh; moreover, an "elastic" device permits a change of speed without the need for special attention.

A gear box taken from a standard chassis and fitted with a glass cover was also shown in order to demonstrate the method of gear changing on the Schneider chassis.

McCurd Lorry Manufacturing Company, Limited (London).—This company exhibited a 4-ton "McCurd" chassis which has many features to indicate the care and thought expended in its design to ensure the maximum life at the minimum cost of upkeep. It has a 4-cylinder engine, 114 mm. × 140 mm., giving 32·8 H.P. R.A.C. rating, the cylinders being cast in pairs. The valves are arranged on both sides of the engine, accessibility being a feature in this as in all other details of the machine. The gear box is of the spur-wheel type, giving four speeds forward and one reverse. Two large ring type universal joints are fitted between the gear box and rear axle, the final drive being by overhead worm mounted on large ball races. The rear axles are of the full floating type. Two entirely independent sets of brakes are fitted. One acts on a drum of ample proportions carried by the propeller shaft, and is operated by a pedal, while the hand brake acts in drums on the rear wheels.

Maudslay Motor Company, Limited (Coventry).—A comprehensive display of the well-known products of this firm was staged in a manner that attracted the attention of all interested in the heavier type of petrol chassis. Included in the exhibit was a handsome motor coach with seating accommodation for 28 passengers, a single-deck omnibus taking 36 passengers, a 6-ton lorry and a 3-ton chassis. The outstanding feature of the exhibit was undoubtedly the new 6-ton model which made its first appearance in public. While many of the Maudslay features are here reproduced, a number of modifications and improvements are incorporated. Certain distinct departures that have also been made call for special mention. The driver's seat is placed beside the engine, so that although the wheel base is only 14 ft. 6 in., a clear loading space in the body is given of 19 ft. 6 in. The engine is in many respects a new production. It is rated at 50-H.P., four cylinders cast *en bloc*, 4½ in. bore with 6-in. stroke, the detachable head being cast in two parts. The overhead bevel-driven camshaft is contained in a casing which is hinged to its supports, enabling it to be swung over to give access to the cylinder heads. The crankshaft is of sturdy construction and runs in three bearings, the camshaft being driven by bevel gear from the back end. The magneto and water pump are also bevel-driven by the same gearing as the camshaft. The final drive is by a double-reduction spur and bevel live axle. Central pivot, Ackermann type steering gear is fitted. Large brake drums are attached to the back wheels (24 in. × 4 in.) and the brake is of the contracting type.

The 36-seated single-deck omnibus is mounted upon the standard Maudslay 40-H.P. worm-driven passenger chassis with 15 ft. 6 in. wheel base. This is exactly similar to the omnibuses now successfully operated in the hilly districts in and around Coventry. The 3-ton worm-driven chassis shown was fitted with a Maudslay 32-H.P. engine. In this case also the driver is situated by the side of the engine, as by this arrangement a short wheel base of 10 ft. 6 in., is made possible without reducing the space available for load. The advantage is that the vehicle can be taken on to any standard weighbridge.



Maudslay Light Weight Omnibus (36 seats).

Ransomes, Sims, and Jeffries, Limited (Orwell Works, Ipswich).—The exhibits on this stand comprised both electric and steam vehicles: a 4-ton "Orwell" chain-driven electric chassis fitted with a flat lorry body; a 2-ton similar machine fitted with an electrically-operated tipping body; an electric truck equipped with steering on all four wheels, and an electrically-operated elevating platform; an electric platform truck; an electric runabout crane, and a 5-ton steam wagon. With the exception of the runabout crane, each of the exhibits appeared to be excellent examples of the well-known standard designs which have found favour with Messrs. Ransome's wide circle of customers. In the crane, however, something entirely new was shown for the first time. The Ransome electric runabout crane truck has been devised by Mr. P. A. Mossay (who is selling agent for Messrs. Ransome's), and is built upon an entirely new principle. Instead of the turntable usually provided to enable the crane to swivel independently of the chassis frame, the crane is rigidly fixed to the chassis of the truck, which is so designed as to turn on its own axis or run backwards and forwards in a path of any curvature. As the crane is fixed to the chassis, the jib is always in the same position relative to the chassis frame, so that there is no variation of the stability factor as the load is removed. The driving wheels are each operated by an electric motor supplied by a battery carried on the truck, and the steering wheels can be rotated in either direction to locations at rightangles to the running positions. Just prior to this extreme position being reached, one of the running motors is automatically reversed, so that the truck then rotates about its own axis without any motion of translation.

Constant demonstrations were given of the extraordinary mobility of this runabout crane, and its evolutions had to be seen to be fully appreciated.

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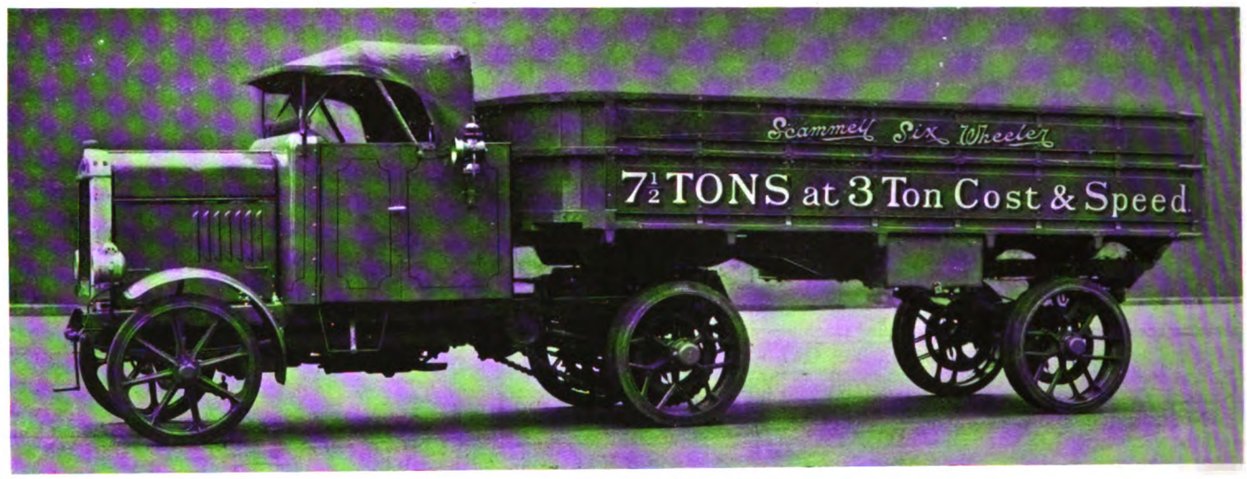
Richmond Motor Lorries, Limited (Bloemfontein Avenue, Shepherd's Bush, W.).—The Wallace pullman coach to seat eighteen passengers was the most noticeable exhibit on this stand. This is a handsome-looking vehicle, well upholstered with bucket type seats and mounted on giant pneumatic tyres. The Wallis motor coach, with a fixed canopy top to which side curtains were attached also received well-merited attention. Both of these vehicles can certainly be classed as of the luxury type; the coachwork in the former was of special construction weighing only 15 cwts. A stripped chassis was also shown. All these machines were of similar type chassis, and were fitted with 25-H.P. Continental engines fixed in the frame by three point suspension.

G. Scammell & Nephew, Limited (Spitalfields).—The development of the 6-wheeled machine has engaged the attention of Messrs. Scammell for some years past, and the examples shown on their stand gave abundant proof of the success of their effort. Broadly speaking, it is claimed for the machines staged that twice the load can be carried by them, when compared with ordinary lorries, at no extra cost. The lorry here illustrated is designed to carry a load of ten tons, and even this limit is not a structional one, as the machine is capable of a much greater load providing legal conditions are complied with. The Scammell 6-wheeler is the first of its type to be manufactured in this country, and its success is due to recognition of the fact that where the load is drawn and not carried, much greater efficiency is obtained. The power unit



Scammell 10-ton Model Six-Wheel Lorry.

is a powerful self-contained tractor with a short wheel base, the back axle of which has an additional set of springs supporting a turntable. The load carrier has only two wheels and therefore rests its forepart on this platform, the whole constituting one vehicle rolling on six wheels. Seven tons, 16 cwts. of paying load can be taken on the carrier without exceeding the legal axle weights, and with this load we are informed there is no difficulty in averaging a speed of twelve miles per hour at a fuel consumption of five to six miles per gallon. A great advantage of this system is the interchange-ability of the carrier bodies. By moving a lever and jacking up the carrier, the body can be separated from the tractor, the operation only taking a few minutes. Another body can then be attached so that the tractor may be utilised much in the same way as a locomotive. An ideal system would include three bodies, one loading, one unloading, and one travelling. In a subsequent issue we hope to give a more detailed description of this novel system of traction.

Sentinel Wagon Works (1902) Limited (Shrewsbury).—"Sentinel" steam wagons of various types made an effective display. These included a 6-ton flat platform wagon with tilt-van body, giving a loading space of 14 ft.; a 4-ton standard platform lorry with a loading space of 13 ft.; a 5-ton end-tipping wagon with a loading capacity for 195 cubic feet; a 6-ton bare chassis and a specimen of the "Sentinel" patent trailer. The latter is an entirely new pressed-steel vehicle of improved design. All these machines are of the under-type variety with vertical water-tube boilers and 2-cylinder high-pressure engines running at a comparatively low speed, the back axle being driven direct through the reduction of the chain drive. All working parts are encased and run in oil.

Star Engineering Company, Limited (Wolverhampton).—Four exhibits representing each of the two models manufactured by this firm were staged. On one of the 2½-ton chassis a 25-seated motor coach, obviously designed to give a high degree of comfort to passengers, was shown. Upholstered in dark green leather, with plated fittings, this presented a most handsome appearance. On a similar chassis a hand-tipping body, with coach-built cab to the driver's seat and a wind screen was shown. This had a short wheel base (10 ft. 6 in.) which would enable the lorry to be weighed on any standard weighing machine. The other exhibits consisted of a pannelled box van and a market gardener's van, each mounted on the "Star" standard 30-cwt. chassis.

Strachan and Brown (High Street, Kensington).—Two examples of the excellent coachwork by which this firm is identified were shown on this stand, together with some ingenious fitments, designed to render public-service vehicles more useful and convenient for the operator as well as to add to the comfort of the passenger. The two omnibus bodies exhibited were designed to carry twenty-two and thirty-three passengers respectively. The former was mounted on a "Republic" chassis and the latter on a Tilling-Stevens standard petrol-electric passenger chassis. Both these vehicles are lightly built and strengthened by means of special steel "U" section brackets at the floor and roof. The interior of the larger body is pleasingly upholstered in moquette, exterior finish is red, and presents a handsome appearance. A unique feature of these single-deck vehicles is the provision of drop-windows along each side of the body. There are eight in the small body, and twelve in the larger one. This new type of window, which is covered by Provisional Patent, may be adjusted to any height with a couple of fingers since it is fully balanced, and is locked rigidly in place by depressing a small lever at the back of the garnish rail. This lever actuates a small shaft connected with a suitable gearing at each end which sets in motion a neat sliding wedge action working along the full length of each side of the glass frame, whatever its position in the run, and also along the full length of the cant rail at the top. The window frame itself is specially constructed with brass channel sides so that the use of the full width of the glass between the pillars is obtained.

The fittings used are simple and inexpensive, and so compact that no extra thickness of pillar is required. The window is suitable for either side, back, or door lights and for any vehicle with a full door running from floor to roof. It is claimed that this window is free from rattle in any position.

Straker-Squire, Limited (Angel Road, Edmonton).—A most attractive exhibit was arranged on this stand, the most prominent feature being the A type chassis, which was shown in a stripped condition in order that the interesting details of its construction could be examined. As stated in a previous issue, this chassis is an entirely new model and departs in many respects from what had previously been the standard practice followed in the "Straker" models. It has many noteworthy points as will be gathered from the following brief description. The engine has four cylinders cast with the top half of the crank case *en bloc*, the cylinder head being detachable.

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The cylinders have a bore of 4½ in. and stroke of 6½ in., recording no less than 65 H.P. on the brake, and developing 54-H.P. at 1,000 revs. The overhead valves are silently operated by rocker arms, mounted on spring-steel bridges actuated by long tubular push-rods, which are adjusted at the top ends. The camshaft and magneto-shaft are driven by silent chains, adjustment for wear being provided by moving the magneto bracket with bearings along slotted holes. The water circulation is by Thermo-syphon system assisted by a two-bladed propeller in the inlet water pipe. The crank shaft, which is of heat-treated nickel-chrome steel, runs in two 7-in. roller bearings and is held in the crank case by steel caps secured by bolts. Lubrication is maintained by means of an oscillating plunger pump, fitted at the back of the camshaft. The clutch is a single disc of saw steel, 16½ in. in diameter, gripped between two rings of Ferodo fabric, 2 in. wide. An efficient clutch-stop enables the operations of gear changing to be performed most efficiently. The gear box gives four speeds and a reverse, the short stiff shafts running on roller bearings. The engine and gear box are mounted on a short and exceedingly stiff underframe suspended from the main frame by three points only, thus providing absolute alignment of engine and gear box under all conditions and dispensing with the usual universal joints. The back axle is of the worm and worm-wheel type, running on roller bearings and ball thrust.

The springing of the chassis represents a distinct advance upon previous practice. The rear springs are 5 ft. 6 in. long and 4 in. wide, and take the torque and thrust. They are underslung by the use of massive "U" bolts. At the front end they are fitted with hardened steel balls working in chilled iron cups. At the rear end cast-iron slippers, working on steel balls, take the place of the usual shackle. In addition to the leafsprings, two taper coil springs are fitted. These take a big proportion of the weight when the vehicle is fully loaded and automatically stiffen up under big deflections. The front springs are also of large dimensions and are mounted in a somewhat similar manner. Both brakes operate on pressed-steel drums bolted to the rear wheels. These are 22 in. in diameter with 3 in. face, lined with Ferodo brake lining. The steering gear is of the screw and nut type with large wearing surfaces, the cross-steering rod being placed behind the axle.

Straker-Squire Single Deck Omnibus.

The overall length of the frame is 22 ft. 8 in., with a wheel base of 14 ft. 6 in. Owing to the driver being seated beside the engine the body space is 15 ft. 8 in. This enables a 54-seated double-deck or a 36 single-deck omnibus body to be fitted without excessive overhang.

The 34-seated single-deck omnibus which we illustrate was also shown. This has a rear entrance and is arranged with seven rows of seats facing forward on each side of the gangway, and provision for three by the driver's seat and three at the rear.

John I. Thornycroft and Company, Limited (10, Grosvenor Place, S.W.1.).—Four representative models of Thornycroft motor vehicles were exhibited on this stand. These included a 30-H.P. Thornycroft type "BT" brewer's lorry with platform body to carry a net load of two tons. This is the latest type of Thornycroft chassis, which embodies many innovations in motor vehicle design. The engine is fitted with a detachable top, also overhead inlet valves operating above the exhaust valves and located in aluminium covers readily detachable for cleaning, etc. Both brake and gear levers are centrally operated by the driver's left hand, an improvement which has several distinct advantages.

The 40-H.P. Thornycroft type "X" single-deck omnibus, seating twenty-five passengers, is a handsome vehicle of the saloon type on a long wheel-base chassis specially designed for passenger vehicles. It is equipped with electric lighting set, operating head, side, tail lamps and interior lights, and is altogether a fine example of the latest type of passenger vehicle for provincial service.

One of the Thornycroft Omnibuses exhibited.

The 40-H.P. Thornycroft type "J" municipal vehicle with special combined gulley-emptier and watering wagon shown was built to the order of the Crayford Urban District Council, and is being supplied with an interchangeable hydraulic end-tipping body for the collection of house refuse. This model is also supplied with special long wheel base for motor coach or omnibus vehicles.

The 40-H.P. Thornycroft type "Q" chassis with box van body, to carry a net load of 4½ tons, is the heaviest of the Thornycroft models, which is similar in design to the "X" and "J" vehicles. One notable exception is the special arrangement of the front wheel swivel pins to provide easy steering, which is effected by bringing the swivel pin immediately over the point of contact between tyre and road.

Tilling-Stevens Motors, Limited (Maidstone).—An exceptionally fine display of petrol-electric chassis and vehicles was made on this stand, the most prominent item being the new London omnibus with which Messrs. Thomas Tilling are replacing the whole of their fleet. With a few modifications to suit London traffic conditions, such as lengthened wheel base and the alteration in spring suspension in order to secure a lower entrance, the chassis supplied for these omnibuses is the Tilling-Stevens 3A type which has such a fine record for passenger service in many parts of the country. The engine is the 4-cylinder enclosed vertical type with a bore of 4¾ in., and a stroke of 5½ in. The valves are of large diameter and are interchangeable. Lubrication is entirely automatic. Zenith carburetter is fitted, this having a water-jacketed induction pipe. The cooling water circulation is maintained by centrifugal pump. The electrical equipment comprises the standard dynamo and motor of the 3A type which has frequently been referred to in these pages. The seating arrangements provide for forty-eight passengers, twenty-two inside and twenty-six outside.

Another vehicle of much interest was the motor coach specially designed for long-distance tours. This was mounted on the new 2-ton petrol-electric chassis which has already demonstrated its reliability and usefulness. In its main characteristics it follows the design of the larger machine and takes the place of the gear-driven chassis which for a time was being manufactured at Maidstone. Both these models were also shown as stripped chassis which enabled visitors to examine the equipment thoroughly and in detail. Owing to the smoothness of the electric drive which ensures entire absence of the jolts and jars so frequent with gear-driven machines, these petrol-electric chassis have a wide field of usefulness in many directions. When it is remembered that they are in reality mobile power stations, with possibilities of running

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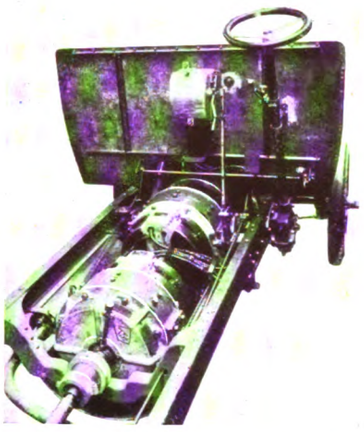
electric search lights, electric welding plants and many other purposes the full value of the system will be appreciated.

Vulcan Motor and Engineering Company (Southport).—The Vulcan two-ton chassis was shown with four types of bodywork, which clearly indicated the usefulness of this well-tried machine. In view of growing demand for smaller and therefore less costly



View showing Electric Equipment of new 2-ton Model.

passenger-carrying vehicles, unusual interest was centered throughout the show on the 22-seated omnibus and the 20-seated motor coach. Both of those presented a most attractive appearance. The Vulcan two-ton chassis is fitted with a four-cylinder engine 90 mm. bore and 113 mm. stroke, the valves being all on one side. An efficient cooling system is maintained by means of a centrifugal pump. A four-speed gear box is operated by a central gate change, the final drive being by overhead worm gear. Ample brakes are provided. The chassis fitted to the omnibus had steel disc wheels with detachable rims and Dunlop giant pneumatic tyres. The body was well designed and well ventilated. The motor coach had Dunlop cushion tyres. It was well upholstered and fitted with a collapsible hood of neat design.

Another example of the Vulcan two-ton chassis was shown with a three-way tipping body, the operating mechanism being the Bromilow and Edward's patent hydraulic gear. A box van, with a fully enclosed driver's seat, completed this interesting exhibit.

Vulcan 22-seater Omnibus.

Walker Bros. (Wigan) Limited (Pagefield Iron Works, Wigan).—The two exhibits on this stand were a three-ton chassis fitted with an overtype tipping wagon with a short wheel base, and a standard three-ton chassis fitted with pneumatic tyres. In the first-mentioned machine the wheel base is only 8 ft. 2 in. and as the driver is situated above the engine, the body space is sufficient to accommodate a specially designed tipping body so arranged that three separate loads of one ton each can be carried and tipped at will. The tipping gear is operated by a drive taken from the four-speed gear box. The three-ton bare chassis has the standard wheel base of 14 ft. 6 in. and is intended for motor coach service. In both exhibits a 40-H.P. engine is fitted.

Yorkshire Commercial Motor Company (Hunslet, Leeds).—This firm exhibited a four-ton tipping wagon on rubber tyres. It was of the standard Yorkshire type, the outstanding feature of which is accessibility. The wagon is fitted with a three-speed gear, giving four, eight and twelve miles per hour. The final drive is by a single roller chain driving through a totally enclosed differential gear mounted on the rear axle. The body was fitted with a patent mechanically-operated end-tipping gear, driven by gearing from the engine.

ACCESSORIES, TYRES, &c.

Allen-Liversedge, Limited (Victoria Street, S.W.).—Complete systems of lighting by means of dissolved acetylene was the main feature here. These included special designs for various commercial vehicles, omnibuses and coaches. A wide variety of lamps suitable for head, side and tail lamps was shown separately; also garage inspection lamps and complete lighting sets for indoor and outside use. Specially designed generators for various purposes, garage welding equipment, and a number of devices employed in the production and maintenance of lighting equipment were also shown. A feature of interest was the Rolph patent automatic traffic warner. This is a simple device which enables the driver to signal to following traffic and indicate his intended movements.

Associated Equipment Company, Limited (Walthamstow.)—On a separate stand in the gallery, the A.E.C. showed the components of their several types of chassis, thus giving all interested an opportunity to inspect minutely each item incorporated in each of their models. Samples of each of the three types of engines were shown as well as the 4-speed spur type gear box, the 3-speed chain type gear box and a series of worm driven axles. The latter are so designed that they can be used with the worm overhead or underneath as required, and will carry loads up to 5½ tons sprung weight.

Avon Rubber Company, Limited (Melksham and London).—A range of Avon band tyres was displayed upon a stand, a considerable portion of which was occupied by a large structure representing the well-known trade mark of the firm—the symbol of endurance. All the well-known types were represented, from the small solid bands for industrial trucks to the standard commercial type, which, owing to its formation, provides efficient traction at a nominal cost. The Avon non-skid solid tyre, specially designed for fire engines, was on view. The cross ribbing of this tyre not only prevents skidding on town roads, but renders it especially suited for country work, as it gives a firm grip to the driving wheels when running on loose or soft roads.

James Bartle and Company, Limited (Lancaster Road, Notting Hill, W.).—This firm's stand was used to display the numerous patent fitments and motor accessories for which Bartle's have established an enviable reputation. Amongst these were towing hooks, thief-proof locks, hood fittings, non-skids and general coach-building appliances. The "Hi-lo" jack was available in several sizes, while a range of the firm's unbreakable aluminium head lamps for commercial vehicles attracted attention.

W. & A. Bates, Limited (Leicester).—The sample tyres shown on this stand comprised a selection of the "Bate's Super Rubber" band tyres, suitable for all types of commercial vehicles, petrol-electric or steam, up to the heaviest class of wagon. Single solids in millemeter fittings were also included, as well as a section of cast steel wheels for steam wagons.

Bergougnan Tyre Company (Store Street, Tottenham Court Road).—This old-established French firm had a fine range of solid tyres, including their standard solid, extra resilient solid, tractor and trolley tyres. The new "Dyasymmetrical" solid is a double treaded tyre, but the two treads are brought close together in order to prevent the picking up of stones in the groove.

British Thomson-Houston Company, Limited (Coventry).—Here was a fine display of magnetos, impulse starters, silent timing gears and electric lamp bulbs. As several of the former were being electrically-operated to demonstrate their reliability at various speeds, interest in the exhibit was continuous. It is claimed that the impulse starter fitted to type "G" magneto will enable the heaviest type of engine to be started with a minimum of effort and without danger of back-fire. The "Tungar" battery charger, a device for charging batteries from an alternating current circuit was also shown.

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Carbic, Limited (Holborn Viaduct).—Carbic cakes for use in acetylene lighting generators is the speciality of this firm, and generators of various sizes were shown, the largest of them being suitable for the complete lighting of omnibuses. Portable welding outfits were also a feature.

Robert W. Coan (Goswell Road, E.C.).—Aluminium castings in great variety were exhibited. These were in both sand and die designs, embracing all the standard fitments for which the firm of Coan is noted. A patent combined step-mat and scraper, weather-tight licence holders, and trade mark plates were amongst the newer designs noticed. Aluminium repairing is a speciality of the firm.

Drummond, Brothers, Limited (Guilford).—Some excellent machine tools formed this exhibit. Most prominent was the 7 in. centres self-acting, sliding, surfacing and screw-cutting lathe with a 6 ft. bed taking 3 ft. 9 in. between centres. This machine has a hollow spindle in adjustable bearings, extra large faceplate, fully compound slide-rest, gapped bed for extra large jobs, set-over tailstock for taper work and reversing countershaft. A most useful tool for tramway or garage workshops.

Dunlop Rubber Company, Limited (London and Birmingham).—The Dunlop exhibit covered a wide range of tyres, and as is usual attracted continuous attention. Amongst the types staged were specimens of solid tyres of standard sizes, as well as super cushion qualities. There were also tractor wheels fitted with Dunlop segmental tyres, diagonal rubber strakes and rectangular pads for tractors, Dunlop wheel equipment for Ford tonners, and a variety of industrial trolley tyres. Dunlop disc wheels, fitted with twin magnum type cord pneumatic tyres, together with Dunlop wire wheels fitted with detachable flanges and giant straight-sided pneumatic tyres, gave evidence that in this section the Dunlop Company are well to the fore.

Ferodo, Limited (Chapel-en-le-Frith).—Ferodo fibre and die-pressed asbestos in various forms were the specialities. Amongst the uses to which these materials were applied were shown brake, clutch and friction linings of every conceivable pattern. The wide extent to which these are now in use throughout the motor industry is the best testimony of their merit.

B. F. Goodrich Company, Limited (Golden Lane, E.C.).—The exhibit of this company included specimens of a large number of rubber goods in addition to the band tyres of the well-known P.B. type. By means of a special process, a perfect union between the rubber and steel band in the P.B. tyre is affected, thus adding to its strength and life.

Hays Standen and Company, Limited (Southwark Street, E.C.).—Don metallic-asbestos fabric for use in brake and clutch linings was the leading feature. This fabric is made in sheet form of various sizes, and can be coned to any angle. Aluminium castings, brass pressings, heavy stampings and a number of pressing and shearing tools were prominent.

Henley Tyre and Rubber Company, Limited (Finsbury, E.C.).—Prominent on this stand was a collection of solid rubber band tyres of the high quality supplied by this firm. "Henley" Zig-Zag 6-in. twin pneumatic tyres specially designed for commercial use were also shown.

E. Kalker and Company (Coventry).—A comprehensive collection of wires and cables, including high tension ignition cable, braided and armoured wires for lighting, and brass and aluminium armoured cables for electric starters made an interesting display. The importance of safe wiring in motor vehicles cannot be over estimated. That this fact is appreciated accounts for the constant attention that was paid to Messrs. Kalker's stand.

Chas. Macintosh and Company, Limited (Manchester and London).—For every type of industrial vehicle there are solid rubber tyres of the well-known "Macintosh" quality. Specimens of each were to be seen. Special features were the 5 ft. steam tractor tyres and the semi-solid or normal air pressure tyres, for each of which there is a considerable demand. The Macintosh special fire engine tyre was also on view.

North British Rubber Company, Limited (Edinburgh and London).—Clincher solid tyres in various sizes and sections were effectively displayed, together with the Company's non-slipping tyre for fire engines, etc. Rubber goods included body buffers, matting, steam hose, etc.

Pirelli, Limited (Queen Victoria Street, E.C.).—The most interesting exhibit was the new type Pirelli solid rubber band tyre, shown for the first time. A variety of the single and twin types of the old pattern were also exhibited, and in this connection it is worthy of note that these are sold with a guarantee of 12,000 miles continuous service without a time limit.

Shrewsbury S. T. and Challiner Tyre Company, Limited (Manchester).—An excellent display of solid rubber band tyres was staged, as well as a variety of wheels, both wood and steel. Special note must be made of the new steel disc wheel in various sizes, suitable for ordinary industrial vehicles as well as the heaviest types of omnibuses and steam wagon.

The Skefko Ball Bearing Company, Limited (Luton, Beds.).—The display of ball bearings shown on the Skefko stand comprised all the possible instances in which they could be incorporated to dispense with friction in motor vehicles. These included ball bearing hubs, shaft bearings, lorry and trailer wheel bearings, as well as a number of roller bearings suitable for the heavier duty. Steel balls in all stages of manufacture were to be seen together with microscopic photos of steel and graphical illustrations.

S. Smith and Sons (M.A.) Limited, (Gt. Portland Street, W.).—Practically every item of motorists' accessories was obtainable on this stand, and many were the exhibits of special interest. Most noticeable was the Smith electric lighting system designed for omnibuses, coaches and industrial vehicles. This was shown in all its details, including the entirely new design of lamp. Carburetters (Smith's special 5-jet type), magnetos, sparking plugs, oil lamps, acetylene lamps and many other items filled a well-arranged stand.

Leo Swain and Company (Deansgate, Manchester).—Rubber goods for the commercial vehicle industry formed a considerable portion of the exhibits on this stand. It is impossible to mention more than a few of the most noticeable, but reference to the well-arranged catalogue issued by Messrs. Swain will well repay time spent in its perusal. Swain's solid rubber tyres were to be seen in a complete range of sizes; also standard and double-weight inner tubes, high and low tension cable, horn bulbs, and garage hose. Considerable interest was taken in the Duff-Barrett jacks, for which Messrs. Swain are the selling agents for the North of England.

C. A. Vandervell and Company, Limited (Warple Way, Acton Vale).—The latest types of electric lamps and fittings for interior and exterior lighting of omnibuses, coaches, and commercial vehicles generally were included in this exhibit. There was also complete lighting and starting sets with all the latest improvements. Batteries for commercial vehicles have received most careful attention at the Acton Works, and the new C.A.V.-Willard range of models shown with threaded rubber insulation is claimed to be a great improvement upon any previous type. A system of spring suspension attached to the battery box has been devised to insulate the battery from road shocks and the vibration experienced on heavy commercial vehicles.

J. Wand and Connolly, Limited (King's Cross).—Wheels as well as tyres formed the display. For many years Connolly Limited have been known for the reliability of their output of artillery wheels, and this reputation they are maintaining by the quality of their super resilient solid tyres, judging by the reports one hears of their service. Electrically-welded steel tyres for steam wagons and trailers were also included in this exhibit.

Wood Milne, Limited (Wigmore Street, W.).—Solid tyres and wheels complete with tyres comprised this exhibit. All standard sizes and sections were shown.

Zenith Carburetter Company, Limited.—Zenith carburetters, suitable for all makes of petrol machines were an interesting exhibit. Specially noticeable was the new triple diffuser for which the highest efficiency is claimed. As a result of the scientific accuracy of measurement and the perfect atomisation of the fuel made possible by the use of this diffuser, it is claimed that acceleration from the lowest to the highest speeds can be effected without hesitation and loss of power.

OMNIBUSES FOR TORONTO.—As the result of the recent visit of Mr. H. E. Blain, assistant managing director of the London Underground Group, to Toronto, at the invitation of the Municipal Council, the city authority have adopted a scheme for running omnibuses to supplement the tramway services. An order has been given for two double-deck omnibuses to Messrs. Tilling-Stevens, Limited, of Maidstone. A specimen of this petrol-electric vehicle was on view at the Toronto Motor Exhibition in August. Trials will also be made of Canadian and American omnibuses.

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PETROL-ELECTRIC VEHICLE DEVELOPMENTS.

As briefly stated in our September issue, Mr. Percy Frost Smith, who, in conjunction with Mr. W. A. Stevens, originated the Tilling-Stevens system of petrol-electric traction, has recently resigned the position of joint managing director of Tilling-Stevens Motors, Limited, thus severing a connection which began in 1907.

In view of the wide experience and practical knowledge of the various forms of mechanical traction which Mr. Frost Smith has gained since he became engineer of the Motor Traction Company, London, in 1899, his opinion as to the future developments of motor traction are of much interest. The vehicles Mr. Frost Smith was called upon to operate in 1899 were built by Mr. Straker, and embodied the salient features of the machines built by Daimler, of Cannstatt. It was not, however, until 1902, when the Milnes-Daimler combination was formed with Mr. H. G. Burford as the moving spirit, ably assisted by Mr. Frost Smith, that anything like real progress was made in the use of motor vehicles in this country. The Hastings Omnibus Company and the Eastbourne Motor Service were two of the earliest motor services inaugurated by Mr. Frost Smith, the latter being in 1902. Speaking of the development of the Manchester and Liverpool Motor Mail Service, which was run by Milnes-Daimler gear-driven vehicles, Mr. Frost Smith says "This venture of Milnes marked a definite forward

Mr. Percy Frost Smith.

step of the commercial vehicle, for the Milnes vehicles were distinctly in advance of anything that had up to that time been created."

The year 1905 marked the commencement of the motor vehicle boom. Messrs. Thomas Tilling had the previous year ordered a number of sample vehicles, and in 1905 appointed Mr. Frost Smith their engineer. A more or less satisfactory service was maintained and in 1907 an interesting electric-mechanical combination was introduced, Mr. Frost Smith and Mr. W. A. Stevens being responsible for the design, which included a patent "dead" back axle known as the S. B. & S., the patentees being Messrs. Smith, Brown and Stevens. The inventor aimed to produce a vehicle with electric transmission and so cut out the gear box. The equipment consisted of an internal combustion motor, direct-coupled to a shunt-wound dynamo with two electric motors, mounted one each side of the main frame, which in turn were direct-coupled to worm-driven road wheels. So satisfactory was the running of this original vehicle that when Messrs. Tillings decided to adopt one type of vehicle for all their omnibus services, the successful pioneer petrol-electric combination had a great influence in causing them to adopt electric power transmission. From 1909 Messrs. Thos. Tilling designed and produced their own vehicles, first at Bull Yard, Peckham, and afterwards at Maidstone, when the Tilling-Stevens Company was formed, Mr. Frost Smith being chief engineer and finally joint managing director.

In reviewing the possibilities of mechanical traction, Mr. Frost Smith gives it as his opinion that the latest designs of the petrol-electric system under all road conditions are as good, if not superior, to any other form of propulsion in efficiency, and from a safety point of view it is vastly superior owing to the ease of control and the fact that the driver may at his discretion put his controller in the reverse position and crawl down a dangerous hill without having recourse to his mechanical brakes. He further calls attention to an extremely important fact, that as yet this system is only in its infancy, for with higher speed engines, or preferably the internal combustion turbine, lighter electrical sets will be possible for a given output, while automatic control of dynamo field resistances together with electric brake control would render these machines absolutely fool proof. To sum up the position, Mr. Frost Smith boldly says "My opinion is born of a strong conviction, the result of many years' experience of various forms of transmission. I believe that, in the absence of a force not yet known, or of a force not yet harnessed, in a few years from now the petrol-electric transmission will occupy the position which the 'gear drive' holds to-day, and that is the end to which I, personally, am working."

Mr. Frost Smith is now engaged in perfecting an organisation for the purpose of developing the petrol-electric system of traction, and an interesting announcement in this connection may shortly be expected.

HEADLIGHTS OF MOTOR CARS.

Prevention of Dazzle at Present Unattainable.

In the third interim report of the Departmental Committee on Lights on Vehicles, which was issued as a White Paper on October 25, the Committee state that they are satisfied that the prevention of dazzle under every condition and circumstance is at present unattainable consistently with a safe driving light. They are of opinion that many complaints of excessive dazzle arise largely from faulty adjustment of bulbs in electric lamps and inaccurate setting of the lamps upon their brackets. Altogether 100 lamps and devices to be affixed to lamps have been examined and submitted to laboratory tests, the more promising being further submitted to road tests under driving conditions. The Committee suggest that the driving light should consist of—

(1) A main beam of light restricted (*a*) in its height from the ground, to avoid dazzling an observer approaching the source of light while he is within the zone which the Committee regard as the danger zone, and (*b*) in intensity between a maximum and minimum.

(2) A secondary diffused light, which may be obtained from either the head lamps or side lamps.

The Committee recognise that the enforcement by the police of regulations upon the lines recommended may present considerable difficulties in practice, and that general compliance therewith would best be attained by co-operation between the lamp manufacturers and the owners of vehicles. Having given consideration to the desirability of making it compulsory that mechanically propelled vehicles, particularly those of the heavier type, should be required to provide a minimum illumination, the Committee, after consultation with the lamp manufacturers, have come to the conclusion that it is not practicable to impose any such regulation.

On the question of swivelling headlights, the Committee feel that pending the production of satisfactory non-dazzle headlights, the use of such devices should be permitted, provided that where more than one headlight is carried the device must be fixed to all, so that they cannot be moved independently; the headlights must otherwise comply with the conditions laid down, and should be incapable of any movement relative to the car except at the will of the driver and in a vertical plane.

Mr. W. G. Howard Gritten, M.P., makes the following reservations—

(1) I consider the references to and definition of safe driving lights unsatisfactory. One of the chief conditions of safe driving is that the driver should be able to bring his vehicle to a standstill within the distance illuminated by his headlights. The speed should depend on the light, not the light on the speed.

(2) I am further of opinion that there should be specified a minimum and also a maximum candle-power for headlights.

A Competition for French Lamp Makers.

At a conference of delegates of automobile clubs of the world held in Paris, the objections attending the use of very powerful headlights were discussed, and a commission was appointed to deal with the question. The Automobile Club de France has decided to open a competition among French manufacturers with a view to evolving a headlight which, while sufficiently powerful, would not be dazzling

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INTERNATIONAL ROAD CONFERENCE.

DECISIONS ARRIVED AT IN PARIS.

Twenty-one nations were represented at the International Road Conference held in Paris from October 7 to 10. The British delegates were Sir Capel Holden, Col. M. O'Gorman, and Sir J. Orde, secretary of the Royal A.C.

It was reported that the French Customs were willing to provide for foreign tourists paying all car taxes at one time and place, instead of at different times and places as at present. In view of the increasing number of motor lorries the conference expressed the opinion that these vehicles should enjoy the same facilities as touring cars, these machines being recognised as efficacious in developing the industries and commerce of each country.

Unanimous assent was given to a proposal that lorries should be obliged to carry mirrors reflecting traffic approaching from the rear.

The new rules of the road recently drawn up by France, providing a complete code for traffic were discussed, including the question of a uniform side of the road for traffic. It was agreed that such a modification could not at present be adopted.

Every country except Switzerland agreed with the French view that motorists might drive at any speed provided the car was under control. The French code provides speed limits for vehicles weighing more than three tons, according to their weight. These speeds appeared excessive to every country except France and Great Britain, and it was agreed that each country should determine its own speed limit for heavy motor traffic.

On the question of abolishing passports, the conference voted for the eventual abolition and the temporary establishment of a single international form of passport.

A committee was appointed to facilitate the drawing up of road statistics in every country on similar lines, in order to render exact comparisons possible.

The question of an international driving license was discussed. In the United States this question is complicated by the fact that the regulations in every one of the 48 States are different. Assent was given to the French proposal that the international document should be divided into two parts; a driving license and a circulation certificate. The delegates decided to take up the matter at once with their respective Governments.

A committee was appointed to draw up itineraries between capitals and the principal towns of the countries interested, the direction posts to bear inscriptions in Latin characters.

AMICABLE WORKING AT PORTSMOUTH.

In a letter to a Portsmouth newspaper, Mr. F. Bartlett, the local traffic manager of the Southdown Motor Services, Limited, says—"The company have received every consideration from the authorities in conducting our traffic in and out of the town, the authorities being fully alive to the immense convenience the service is to dwellers outside of the town, and the large amount of business brought to business establishments by the ease and quickness with which country shoppers are brought in. We in no way compete with the tramways, as by arrangement with the authorities, our lowest fare inside the borough is sixpence. The restrictions and regulations imposed are quite reasonable, aiming only at the public safety and proper control of the traffic."

OMNIBUS CHARGE AT GREAT YARMOUTH.—What is probably the highest charge made upon omnibuses has to be attributed to the Great Eastern Railway Company. Only the Gorleston section of the tramways passes the Southdown Station, the swing bridge over the Yare preventing the main system being linked with the principal station. For the convenience of the public using the Southdown Station the tramways department run their omnibuses thither, traversing about 100 yards of roadway belonging to the company. At the request of the company the Corporation have agreed to pay £30 per annum for bringing traffic to the railway. It is not surprising to learn that at the meeting at which the proposal was adopted there was adverse comment, and that Councillor McGowan stated there would be other arrangements before next season. For the year ended March 31 last the omnibus service of the Corporation resulted in a loss of £236.

OMNIBUS SERVICES.

ABERDEEN.—The Corporation intend to apply for full Parliamentary powers to run omnibuses. These vehicles are already operated on one or two routes by the tramways department.

BIRKENHEAD.—The Tramways Committee have authorised the town clerk to communicate with the District Councils of Bromborough and Lower Bebington with regard to proposed omnibus services.

BLACKPOOL.—The Corporation have received a report from Mr. C. Furness, the tramways manager, with reference to the proposed purchase of six omnibuses. Mr. Furness estimates that for the first three years the service will show a deficit of approximately £2,000 per annum, and that at present prices regular omnibus services cannot be considered as a paying proposition.

BLACKPOOL.—The Tramways Committee recommend the purchase of six omnibuses so that proposed services can be inaugurated. In the meantime, the Watch Committee have deferred applications from Mr. W. Smith and Messrs. Edwards and Company for licences to enable them to start services.

CHESTER.—The Watch Committee have given permission to Mr. Wm. Manning to run an omnibus service between Chester and Marford, subject to the service being run to a time table approved by the chief constable.

HALIFAX.—It is proposed by the tramways committee to make a six months' trial of workmen's omnibuses to Siddal.

HUDDERSFIELD.—The tramways manager has been asked by the Corporation to arrange for a service of omnibuses to Kirkheaton.

HULL.—The Provisional Order enabling the Hull Corporation to run omnibuses has been confirmed, and the Tramways Committee are applying to the Ministry of Transport for permission to borrow £10,000 for the purchase of five omnibuses, and £2,500 for other purposes in connection with the scheme. The new Order only enables the Corporation to run services within the city, but the Transport Ministry have intimated that if at a later period the Corporation have any definite scheme for the running outside the city, a further application can be made to the Ministry. The Watch Committee were recently informed by the chief constable that there were applications from people in other districts for licences for omnibuses to ply for hire in the city. It was stated that in other districts the local authorities objected to Hull omnibuses plying for hire. The committee adjourned the matter pending inquiries as to the methods adopted in other districts with regard to Hull omnibuses.

LANCASTER.—The Tramways Committee have had a memorial calling attention to the need of a motor omnibus service to Skerton, and have empowered the Omnibus Committee to deal with the matter. The Garstang Motor Engineering Company, Limited, have protested to the Tramways Committee against "the running of a further omnibus service along their route between Lancaster and Garstang." The committee took no action.

LONDON.—A proposal to introduce "express" omnibuses between Ilford and the city is under the consideration of Ilford Urban Council, the London General Omnibus Company, and the Ministry of Transport, from the point of view of feasibility. Since the beginning of September the London General Omnibus and allied companies have opened up nearly one hundred miles of country routes.

PORTSMOUTH.—Prior to deciding to carry out their powers for the construction of a tramway from Milton to Hilsea along the Copnor Road, the Tramways Committee are testing the traffic capabilities of the route by running omnibuses from Eastney to Cosham along Copnor Road. A drawback to the experiment is that the fares are necessarily high, but this consideration will be taken into account.

PRESTON.—The tenders of Leyland Motors, Limited, for the supply of three omnibus chassis for £3,340 10s., and the English Electric Company, Limited, of Preston, for three bodies for £1,425, have been accepted by the tramways committee.

SHEFFIELD.—The tramways committee have recommended the purchase of a single-deck Leyland omnibus at a cost of £1,684.

SOUTH SHIELDS.—The Corporation have arranged to discuss with the South Shields Rural Council a proposal for an omnibus service to Boldon Colliery.

SOUTH SHIELDS.—The Tramways Committee have accepted the tender of Messrs. Thornycroft and Company—subject to the firm being able to satisfy the tramway manager as to time for

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delivery—for the supply of three chassis of 40 horse power at a cost of £893 each. The committee had 18 tenders for the supply of the vehicles. The firm of Christopher Dodson were asked if they would depart from the standard frame and supply teak framing instead. Messrs. Dodson would not deviate from the specification, but the English Electrical Car Company offered to provide teak frames at the price of £400 per car. The committee accordingly accepted the tender of the English Electrical Car Company for the supply of three bodies at £400 each.

YORK.—Before coming to a decision on a proposal to run omnibuses to Clifton, the Tramways Committee have asked a sub-committee to report as to the cost of running omnibuses and railless trolley cars.

MOTOR VEHICLES FOR MUNICIPALITIES.

LLANELLY COUNCIL are borrowing £1,352 for the purchase of two lorries.

BATH CORPORATION are borrowing £7,945 for the purchase of electric vehicles.

PORTSMOUTH CORPORATION are raising a loan of £3 200 for motor tyre appliances.

BOURNEMOUTH BEACH COMMITTEE have recommended the purchase of two electric runabouts.

BLACKPOOL CORPORATION have called for tenders for the supply of a lorry for the parks department.

HARROGATE CORPORATION have secured permission to raise a loan of £1,642 for the purchase of a motor fire engine.

CHESTER ELECTRICITY COMMITTEE recommend the purchase of a car for the engineer at a cost not exceeding £250.

ROTHERHAM CORPORATION propose in the next financial estimate to make provision for the purchase of a motor ambulance.

BRIDLINGTON HIGHWAYS COMMITTEE recommend the purchase of a 5-ton Clayton steam wagon and two 3-ton side-tipping trailers, at £1,400.

LONDON COUNTY COUNCIL have ordered from Tilling-Stevens Motors, Limited, at a cost of £1,482, a chassis for a fire brigade turntable ladder.

WARRINGTON COUNCIL have authorised the borough surveyor to hire a 5-ton petrol tipping lorry, so that comparison can be made with the work done by horse-drawn vehicles.

BRADFORD WATCH COMMITTEE have decided to purchase a motor vehicle of the taxi-cycle type, and a motor cycle with side car for police use, at a total cost not exceeding £450.

LANCASHIRE COUNTY COUNCIL have been recommended by the Highways Committee to purchase four 2-seat Swift motor cars at £415 each for the use of the district surveyors.

CAMBERWELL WORKS COMMITTEE recommend the purchase of a 5-ton Sentinel rubber-tyred end-tipping steam wagon, at £1,185, this price to include fitting with a special crane.

MELBOURNE CITY COUNCIL have decided to invite tenders for three motor road-sweeping machines, their Works Committee having reported that each machine will effect a saving of 15s. a day.

YARMOUTH TRAMWAYS COMMITTEE recommend the purchase, for £150, of a second-hand Tilling-Stevens petrol-electric omnibus, subject to examination by a motor expert engaged by the tramways manager.

HALIFAX CORPORATION TRANSPORT COMMITTEE have visited Huddersfield to inspect a Karrier motor sweeping and loading machine, but have postponed the question of the purchase of such a machine for 12 months.

LEYTON URBAN COUNCIL have come to the conclusion that two more motor dirt vans are needed and have appointed a sub-committee to consider the type of vehicle to be purchased, and if deemed necessary to visit districts where such vans are in use.

RIPON.—The Industrial Committee and the town clerk have prepared a report on the possibility of bringing outlying places into closer connection with the town by means of coach and omnibus services. The report expresses preference for single-deck omnibuses and suggests that coaches with hoods might suffice for testing routes. The belief is expressed that under efficient management omnibus services would prove a success, but unless the proposal is taken up forthwith, the city will become merely a calling place for vehicles from other centres.

MOTOR TRAFFIC NOTES.

LONDON COUNTY COUNCIL AMBULANCE SERVICE.—Last quarter the London County Council motor ambulance service dealt with 5,845 calls, compared with 4,789 in the corresponding period last year. The Council are building a new ambulance station at Poplar.

ATTENDANTS ON TRAILERS.—The Public Control Committee of the London County Council have recommended the Council not to support a demand for legislation to compel an attendant to be placed on all trailers in order to warn the driver when overtaking vehicles desire to pass.

AN EXPERIMENTAL MIRROR.—In view of the dangerous nature of the corner at the junction of Woolwich Road and Westcombe Hill, Greenwich Borough Council have decided to erect an experimental mirror in order that traffic down the hill can be warned of traffic approaching from Woolwich.

DEVELOPING THE ELECTRIC VEHICLE.—Tynemouth Corporation Electricity Committee have voted a two-guinea subscription to the Electric Vehicle Committee, in view of their useful work in assisting the introduction of electric vehicles into this country and arranging for the standardisation of parts, etc.

SCHOOL OF HIGHWAYS ENGINEERING.—The Council of the Institution of Municipal and County Engineers has expressed sympathy with the project of the Paviors' Company for a school of highways engineering, and asked for details so that the Institution can consider the question of co-operating in the scheme.

LIVERPOOL-MANCHESTER MOTOR ROAD.—Warrington Corporation have asked the Lancashire County Council to consider the advisability of constructing a new road for motor traffic between Liverpool and Manchester. The County Council have replied that such a road is quite outside the kind of work which can be carried out at the present time.

SALFORD CORPORATION have seven motor omnibuses, and during the year ended March 31, 1921, the working expenses amounted to 16·13d. per omnibus mile, and the traffic revenue to 19·837d., the percentage of working expenses to receipts being 81 per cent. The average car mileage per day per omnibus was 97, and the average speed per hour was 6·53.

SCHEME FOR A LEEDS-BRADFORD ROAD.—Leeds Corporation have received an intimation from the Bradford Town Planning Sub-committee that they will be prepared to co-operate in the construction, at some future date, of a new arterial road *via* Pudsey and Bowling Back Lane, Bradford, to relieve the traffic congestion on Leeds Road, and to facilitate transport between the cities.

AUTOMOTIVE DIVISION OF U.S.A. COMMERCE DEPARTMENT.—The U.S. Government have recently formed an Automotive Division of the Department of Commerce for the purpose of helping the American motor trade to extend its export business. The department proposes to pursue an active policy, and has chosen India, Australia, and South Africa for its first fields of operation. The United States aims at placing during the 1922 season 500,000 cars in overseas markets.

THE GOVERNMENT'S SEARCH FOR OIL.—According to *Oil News* the series of about a dozen boreholes begun by the Government in 1918 in a search for oil in this country are now all abandoned except two—that at Werrington, Staffs., and that at Darcy, near Edinburgh. The most recent to be given up is that at West Calder, near Edinburgh, which had reached a depth of 3,923 feet. The only well in which oil was struck, that at Hardstoft, Derbyshire, continues to flow at the rate of about four barrels of oil daily. It has now been producing without a break for two years and five months. The only well drilling for oil in Great Britain, besides the Government boreholes, is at Kelham, Notts.

DEATH OF INVENTOR OF THE PNEUMATIC TYRE.—The death in Dublin of Mr. J. B. Dunlop recalls his invention of the pneumatic tyre in its crude form in 1888. The cover was solutioned to the rim, and in order to repair punctures it had to be pulled away and re-solutioned. In 1892 C. K. Welch devised the wired-on cover, and Bartlett followed with the beaded-edge. On these devices the Dunlop Company built up their gigantic business. The inventions also made possible the introduction of the motor car. The Dunlop Company spent large sums in defending the patents in the law courts, and several fortunes were made before the patents expired some years since.

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THE Tramway & Railway World
WITH MOTOR TRAFFIC SECTION

Founded 1892. LONDON, DECEMBER 15, 1921. VOL. L.

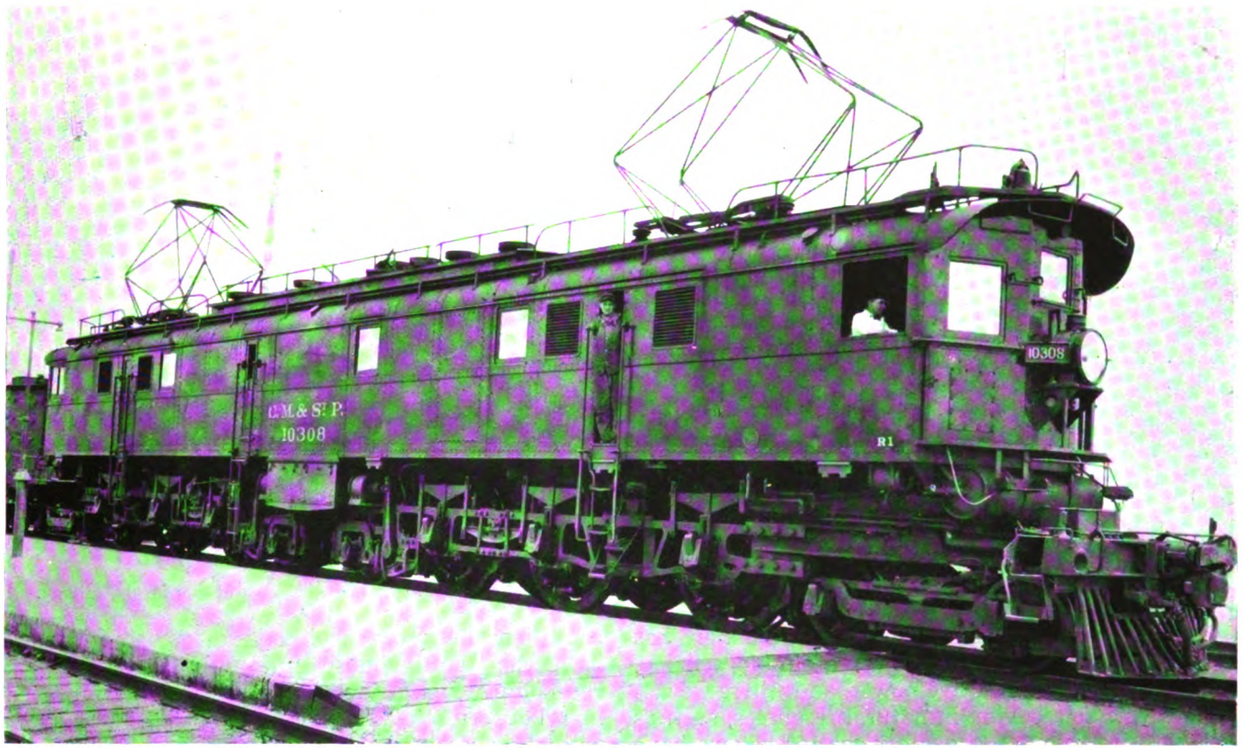
ELECTRIFICATION—THE FUTURE OF RAILWAYS.

An Abstract of a Paper read before the Canadian Railway Club at Montreal

By W. R. STINEMETZ,
of the Railway Department, Westinghouse Electric and Manufacturing Company.

While to-day railway electrification is regarded as desirable, we believe that in the future it will be considered one of the essential factors of successful railway operation. It is only recently that the public has begun to realise what an important factor transportation has become in the life of the community. This realisation of the seriousness of the railway situation and its influence in the daily life of the people has created a very lively and beneficial public interest in this problem. To grow industrially, to improve in civilisation, we must make our transportation system ready to carry the burden. What are we now doing to fortify the railways to match industry? Surely we all realise that when transportation halts, industry is paralysed with startling rapidity and appalling cost.

Almost every former attempt to visualise the facilities required has been under-estimated. The size of train and power of locomotives have constantly increased in an effort to keep up with the demand. Terminals have been built and stations provided which have often proved to be inadequate by the time they are completed.



Electric Locomotive on Chicago, Milwaukee, and St. Paul Railroad.

It is such conditions that electrification can successfully meet by permitting a more intensive use of the present facilities.

The application of electricity to the needs of railways has barely begun. It has been applied from time to time as a means of solving some difficult local operating problems, and each time has demonstrated its suitability. In no case has it been taxed to its limit, and wherever applied more reliable operation and

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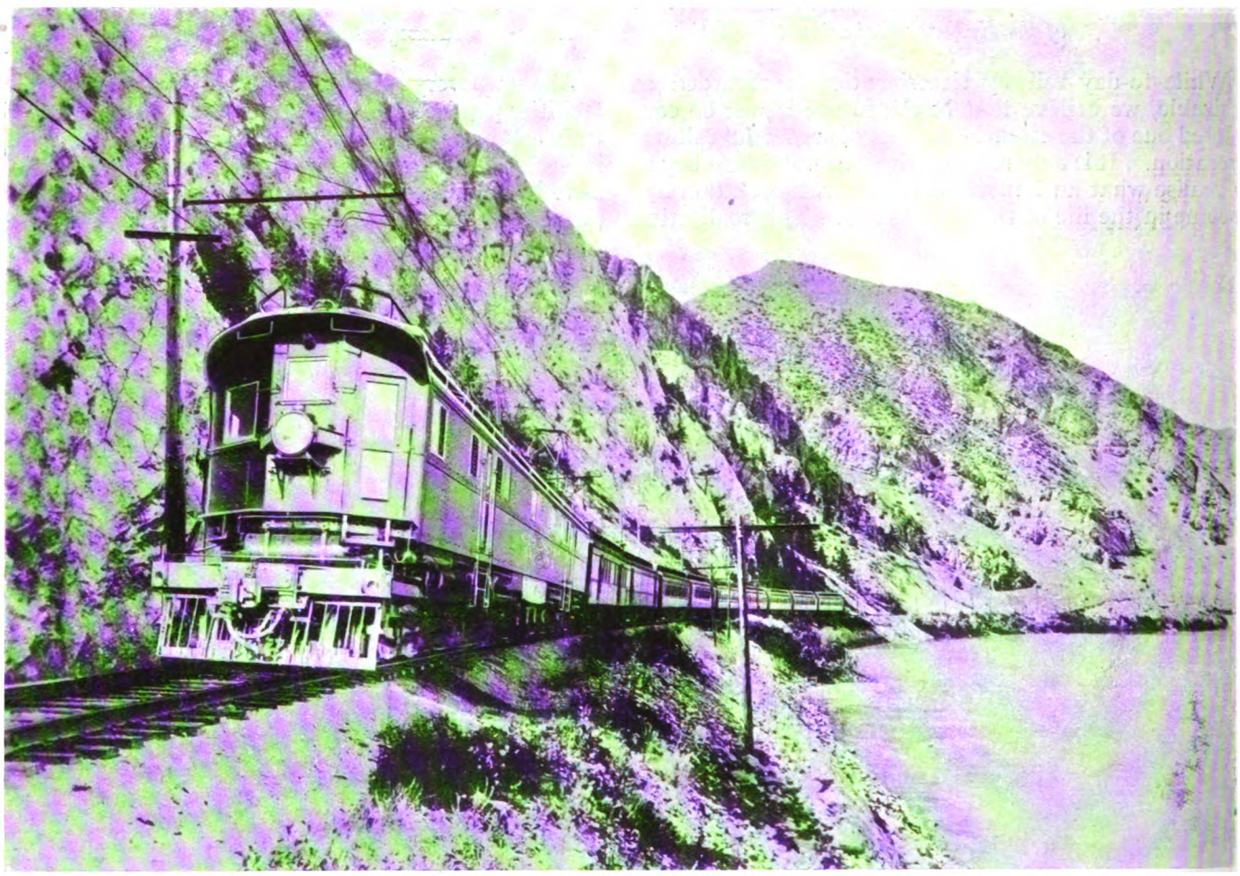
improved service has resulted. This has been accomplished in spite of the fact that the steam engine to be replaced is a highly developed and efficient machine, while the electric engine and system has been in a state of evolution.

In each case we have applied that class of apparatus most suitable and available at the time. We quite often find these applications questioned from the view point of later development, but the fact that they have been successful in supplanting steam operation, even though in a partly developed state, is sufficient justification. Some of these applications have been handicapped by the newness of the tool. An improper understanding and appreciation of its virtue has resulted in lack of administration, at times resulting in high maintenance costs; but even in these cases it has paid.



Electric Locomotive Hauling Express Passenger Train up an Incline on Chicago, Milwaukee and St. Paul Railway.

From an operating standpoint electrification has reached the stage of acceptance as a desirable, reliable, and economic form of motive power, and where we can couple with this a saving in natural resources, such as available water power as against coal or oil, we have the reason for the world-wide interest in electrification.

This condition exists in France, Japan, Switzerland, Italy, Brazil, Sweden, and Chile, and in all of these countries an active programme is being carried out. Most of these countries had their transportation system badly crippled during the great war by scarcity of coal, and in some cases the impossibility of obtaining a supply at any price. All are now developing their hydro-electric projects, even under the present disturbed market conditions. France has estimated that by the electrification of her three principal lines, involving 5,280 miles of track, an annual economy of 1,500,000 tons of coal will be obtained. The large amount of water-power available in the Alps and Appennines has caused Italy to lay out a programme of electrification embracing 1,800 miles of road. In Sweden the programme calls for the expenditure of approximately $12,000,000 during the next few years. Japan has a definite plan with hydro-electric power for electric operation during the next five years of from 500 to 700 miles of main line, and has already ordered trial locomotives. Last year the Paulista Railway in Brazil started an electrification programme with about 73 miles of track and 16 electric locomotives. It is logical that they should arrange to utilise in the future the abundant water power after their recent experience when compelled to go back to the burning of wood in locomotives on account of shortage of ships to import coal. The Government of Chile, with similar conditions, has recently placed a 7,000,000 dollar order with the Westinghouse International Company for the complete electrification of their important trunk line between Valparaiso and Santiago. This work will embrace about 200 miles of track and include 39 locomotives.

In the United States the incentive to electrification is not so prevalent owing to the abundance of coal in the regions of heaviest traffic. Electrification is there being studied more with the idea of improving operation, and thereby eliminating the necessity of additional capital expenditures for greater trackage facilities. Its application has come where the greatest local advantages could be obtained. In many cases this application has only been partial, and the combined steam and electric operation has restricted the economies which would have resulted from complete electric

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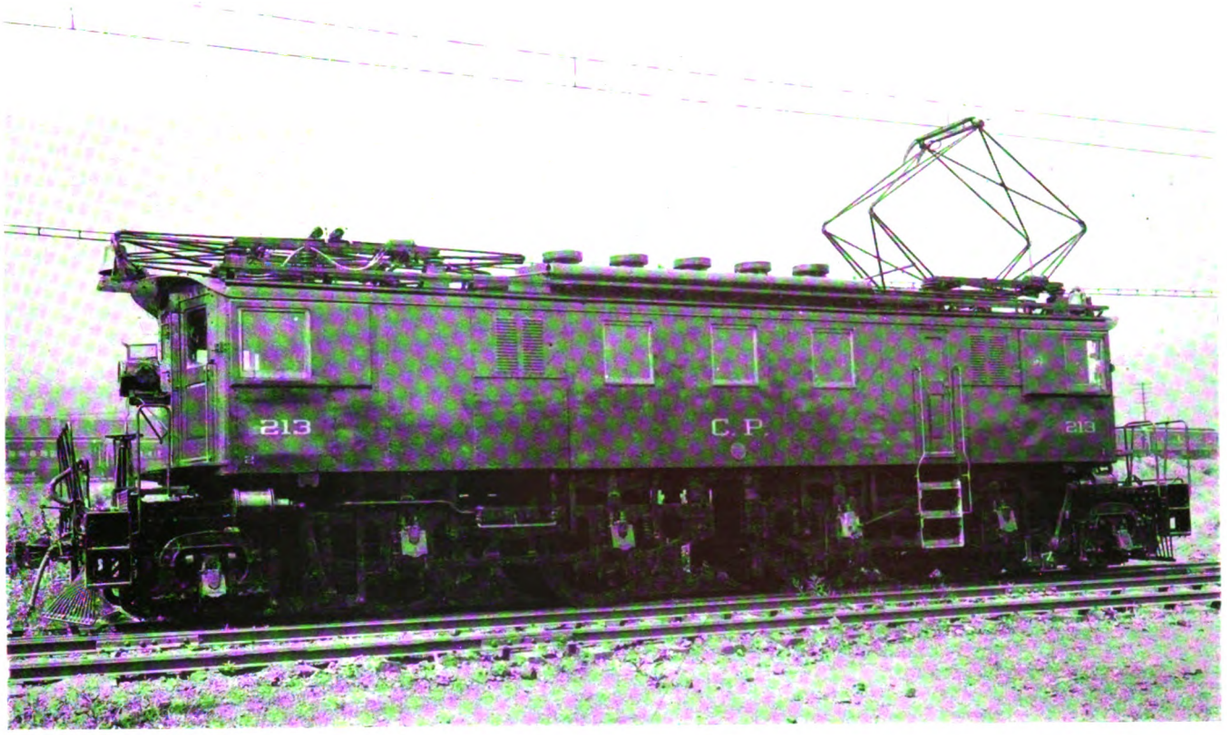
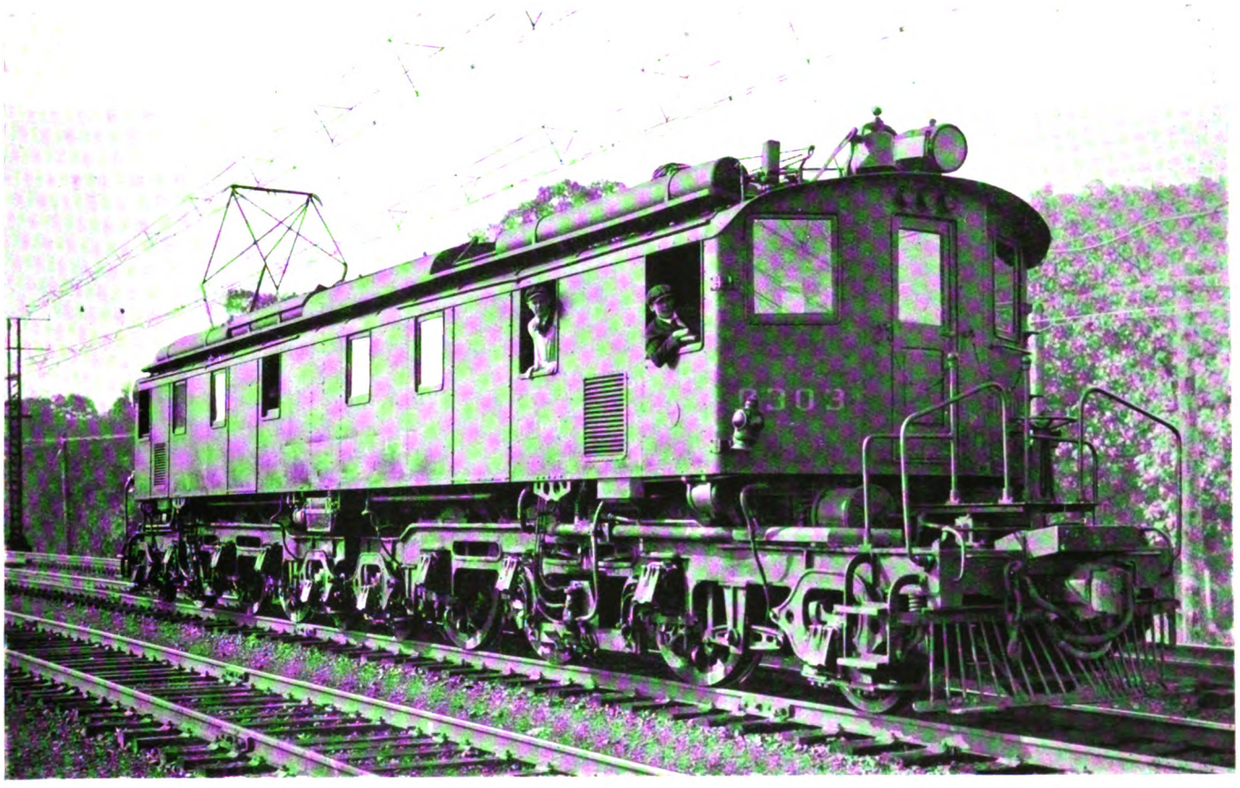


Electric Locomotive.



Electric Locomotive—New York, New Haven, and Hartford Railroad.

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operation. Probably the most important of such applications has been the introduction of electric operation in connection with long tunnels. Here the question of ventilation was a positive restriction on the intensive use of the railway plant. The Hoosac Tunnel of the Boston and Maine Railroad and Simplon Tunnel are prominent examples of such application.

The electric locomotive can furnish unlimited power for expediting traffic over heavy grade sections. This characteristic of the electric locomotive has resulted in saving heavy capital expenditures for additional tracks, and, coupled with regeneration, has added materially to the safety in operation when descending these grades. The Norfolk and Western Railway is now handling with electric locomotives over their heavy grade division more than double the traffic, with much less congestion, than they formerly experienced with steam.

The Norfolk and Western Railway's modern Mallet compound superheating steam engines, equipped with all improvements except feedwater heaters, require 5·4 lbs. of coal per draw-bar horse-power when operating under their road conditions, and allowing for standby losses. With electric operation about 3·3 lb. of coal are required per draw-bar horse-power, which gives a direct saving in fuel of 40 per cent. The saving in crew cost due to the additional work which the electric engine can perform in a given time has been stated to be between 35 and 40 per cent.

Another application has been effective in meeting the increasing requirements for terminal facilities. The use of multiple unit electric trains greatly relieves terminal congestion by eliminating shunting and making up of trains, common to steam practice. It permits the more intensive and elastic use of terminal facilities in built-up communities where sites for extensions both of building and track are difficult to obtain. This is best demonstrated by the results achieved by the Pennsylvania Railroad in electrifying their main and branch line suburban service out of Broad Street Station, Philadelphia. This station was originally designed to handle 160 trains per day, but traffic has now reached a total of 600 trains daily, even though many trains have been diverted from this terminal. It would have been very expensive, though hardly practical, to have enlarged this terminal due to the valuable buildings and property surrounding it.

Aside from the great capital investment saved by this electrification, the following lesser economies were cited as having been effected.

(1) Due to less movement being required for making up electric trains, because electric locomotives do not have to be cared for and run to and from the engine-house, the capacity of the throat tracks feeding the station has been increased considerably, which increase was required by the traffic.

(2) The steam locomotives formerly handling this service have been released.

(3) The locomotive handling facilities, which were overcrowded, have been relieved of congestion and their necessary expansion deferred.

(4) The stoker required in steam service is not needed on the electric trains.

(5) There is no doubt some saving in coal.

(6) The service is more reliable, quicker, cleaner, and more attractive. Schedules are more closely adhered to, all of which has helped to build up the suburban communities served, thus increasing traffic.

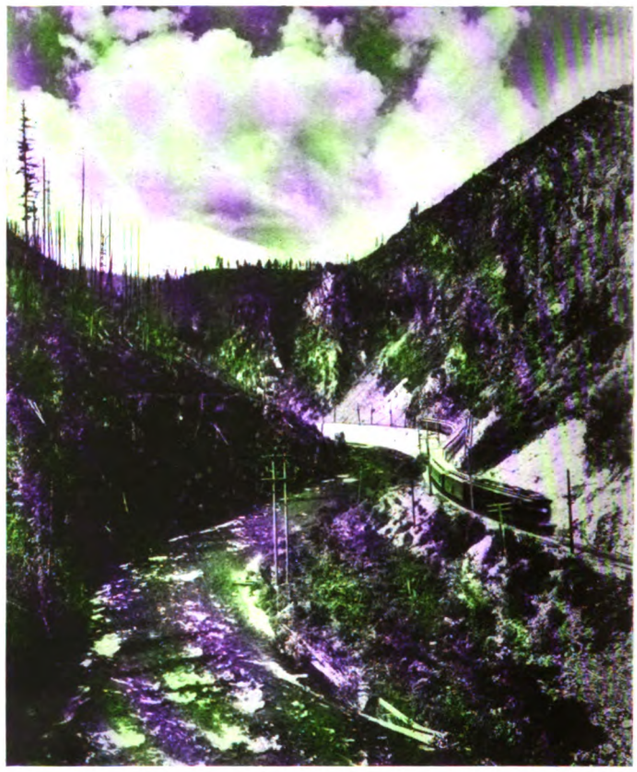
(7) Because suburban trains run more nearly on schedule, they do not interfere with the through trains, and a higher main line track efficiency results, with less train delays.

(8) The smoke conditions in the city district have been materially improved.

Not all of the above are readily convertible into money, but they nevertheless exist, and amount to real economies in the broader sense.

All large cities, owing to their rapid expansion, are now confronted with the problem of congestion in local transportation. They have built electric surface lines, elevated tracks, subways, and tubes, but always the demand seems to be a little ahead of the facilities. Have the railways done their part in solving these civic problems? Would not terminal electrification by permitting a more continuous use of present tracks not only create additional local travel, which could be profitably handled, but also relieve the congestion on the street lines during the heavy rush hour period?

The most prominent case in America of electrification for the conservation of natural resources is that of the Chicago, Milwaukee and St. Paul Railway. It is doubtful whether electrification of this long, single track system with limited traffic would have been justified had it not been for the cheap power available



Electric Train Ascending a River Gorge.

from hydro-electric developments. With this saving in power cost to carry the capital expenditures, electrification has enabled this road to capitalise the many minor advantages of electric operation, such as improved service, especially in cold weather.

With the new electric passenger locomotives put in service a year ago, the Milwaukee makes a 440-mile run with one engine. During the stop at Deer Lodge, the midway point, only the engine crew and train crews are changed. The locomotives are taken off for shop inspection after mileage varying from 3,000 to 5,000 miles, which means an inspection every eight or ten trips. Under this operation these locomotives have been making records of from 10,000 to 11,000 revenue miles per month. This again is an example of intensive use of facilities.

There are two objections often advanced to electrification—one is the cost, and the other is the fact that the details of type and system have not been fully

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developed and standardised. Electrification is expensive, but in no case has it failed to carry at least the capital charge. The situation is a parallel to industrial application where electrification has virtually supplanted all other forms of power. New tools are always expensive, and electrification is a new tool, but you can get with it that which you cannot obtain with any other tools. If we are to keep abreast of the times we must spend money. The proper units must be provided for the future, regardless of cost, otherwise we shall be restricted in our industrial growth and social development, to avoid which almost any price would be cheap. Does any railway double its track because it will pay for itself at once? Could some of the larger systems justify their revisions of grades and curves on the basis of savings? No terminals, or change of route, or grade revisions are expected to pay for themselves on current business, but are built for the future expansion.

If we were to hesitate in expectation of final development, we would stop all progress. Standardisation is a good thing after development has reached that stage which will permit of its most economical application. Standardisation, however, which will retard development for some other selfish purpose is undesirable. Have the railways standardised their steam locomotives to-day? They have been building them for nearly a century. We are not yet ready to handicap the developments of the future with standards which are only a measure of our present ability. Any attempt at standardisation which will tend to limit this growth of the application of electricity, such as system of frequency, is not only an injustice to the coming generation of engineers, but it will in the future be swept aside if necessary by advancing science. What we should do in planning for the future is to capitalise the experience of the past, and so arrange our programme that we will not be handicapped by future requirements and developments.

One thing which is absolutely certain is that the railways are going to live and expand. This expansion is going to be largely in the form of improvement in operation and service, rather than in physical dimensions. This will require an increase in efficiency of movement, as well as economy of operation, and a more intensive use of present facilities. The present thought seems to be that this will be accomplished largely through heavier trains and higher speed and continuous movement, using more efficiently the tracks that at present exist. This will involve the concentration of large power to constantly moving trains. Electricity is the most flexible and economic means of transmitting power yet discovered. This flexibility will permit railways to adjust the transfer of power to meet constantly changing conditions, and always to adapt it economically to the growth and movement of traffic.

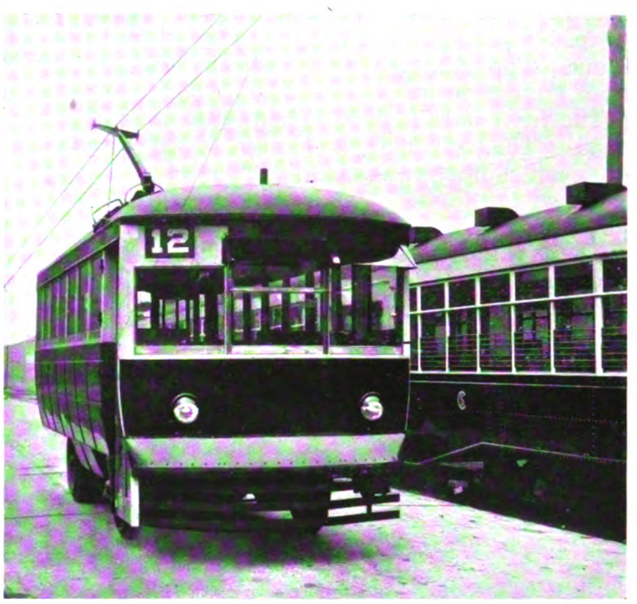
Christmas Day Cars: Lancashire and Cheshire Decision.—At a meeting of the Lancashire and Cheshire Tramways Authorities' Council held at Manchester, Mr. J. Beckett (joint secretary of the National Joint Industrial Council for the Tramway Industry) gave a *résumé* of the proceedings of the National Council on the question of operating tramways on Christmas Day (as reported in our issue of October 15). The Lancashire and Cheshire Council unanimously resolved that in their opinion a service of cars should be worked on Christmas Day where the tramway authority so desires. It was further considered what action should be taken if the employees refuse to work on Christmas Day, where requested, and it was resolved—"That it be a recommendation to the various tramways authorities to notify their employees who decline to work on Christmas Day that they have broken their continuity of service, and that they shall forfeit two days' holiday for the ensuing year."

THE BRILL RAILLESS TROLLEY CAR

One-Man Operation for 50 Passengers.

After a series of tests, the J. G. Brill Company, of Philadelphia, have developed a railless trolley car with some notable features. Their tests have proved that the experimental stage has been passed, and that this railless car will operate economically and with low maintenance costs. It is exceptionally fitted for localities where the traffic is light, where the initial cost of track and its maintenance would prohibit the economical use of "safety" cars, or where electric railways find it impossible to relay the tracks to continue existing service. Further, it may be considered suitable for boulevards and highways where the laying of tracks would not be permitted.

The Brill railless car is operated by one man, and is of standard construction, 21 ft. 2 in. long over bumper, 7 ft. 6 in. wide, and 9 ft. 8 in. high, seating 28 passengers with sufficient space for 22 standing passengers, thus giving a total carrying capacity of 50. It is designed with a minimum turning radius,



Brill Trolley 'Bus that Turns in a Street 40 Feet Wide.

so that it will readily turn in a street 40 ft. wide. The pole and collector construction is such that the car can be operated 16 ft. either side of centre of the two conductor wires, viz., a maximum of 32 feet, which permits collecting or discharging passengers on the sidewalk of a street 40 feet wide from kerb to kerb. This wide deviation from a fixed line of travel also permits the car to pass other vehicles with safety.

Speed is dependent largely on the condition of the roadway and grades. With a fair paving of block, concrete, or other hard roadway, the free running speed of this car fully loaded is 22 to 25 miles per hour. The rate of acceleration is $1\frac{3}{4}$ miles per hour per second, and the deceleration is $1\frac{3}{4}$ miles per hour per second, which gives a schedule speed of 9 to 10 miles per hour with eight stops of 15 seconds each per mile.

The vehicle is driven by two motors, each having a capacity of 25 H.P. at 550 volts, arranged in tandem. The use of two motors with series parallel control is recommended, as it will show a saving of 20 per cent.

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to 30 per cent. in power consumption as compared with one motor and resistance control, depending on the frequency of stops and the amount of slow speed operating in traffic. Either General Electric Company or Westinghouse equipment can be furnished at option.

A single pole is used of light flexible design, and carried on a standard trolley base. The collector is of special Brill design, with sliding contact shoes, and is attached to the pole by a ball-bearing socket, which permits the collector to adjust itself when passing around curves in the overhead. It is also designed so that the pressure on the two wires is equalised. The collector can be furnished for a wire spacing of either 15 in. or 18 in.

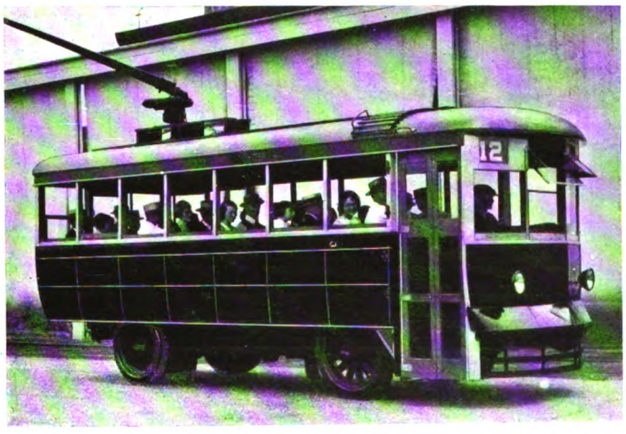
A special type two-rope trolley catcher is provided for dewiring, and also to take up slack of rope to compensate for various heights of overhead.

Chassis Details.

The vehicle weighs 10,000 lb., exclusive of passenger load. The chassis is specially designed for railless car service by engineers who have been designing successfully electrically-driven road vehicles for years. Nothing of an experimental nature is embodied in the chassis. The wheel base is 10 ft. and the tyres are 34 in. by 4 in., single front, dual rear. The length of frame is approximately 20 ft., and the height of frame from ground 30 in.

The front axle is drop forged with integral spring pads. The rear axle is of the worm-drive type. The semi-elliptic springs are of alloy steel, heat-treated. The two top leaves of all springs are turned over to form the eye.

The two motors are mounted amidship, driving the rear axle through propeller shaft. Both front and rear ends of the shaft are equipped with universal joints enclosed in dust-proof metal housings to prevent entrance of dirt to working parts. The car is equipped with resilient cushion tyres.



Brill Trolley 'Bus Showing Front Entrance and Dropped Windows.

Two brakes are provided. The service brake is of expanding internal type mounted on drum on rear wheels. This brake is operated by foot pedal. The emergency brake is also of the expanding internal type, mounted on a drum on the rear wheels. The brake is operated by a lever located convenient to the operator's right hand.

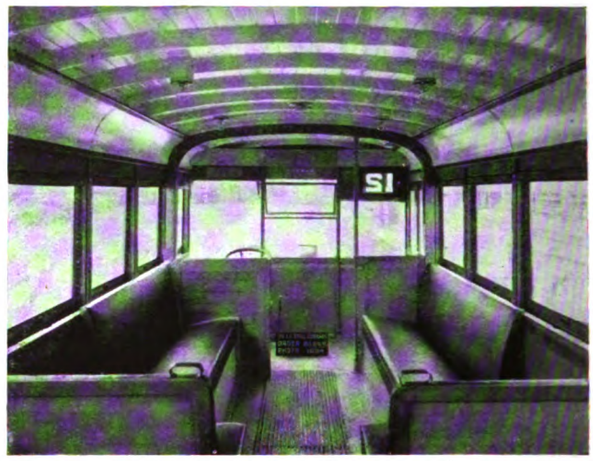
The steering gear is of the irreversible type, and the wheels are equipped with lugs for attachment of truck skid prevention chains. The frame is of structural steel shapes accurately fitted and hot riveted. Spring bolts at all points are interchangeable. The "Hotchkiss" type of drive is used because it imposes a minimum of sudden shocks to the rear axle.

Body Specifications.

The dimensions of the vehicle are as follow—

Length of body over corner posts	20 ft. 5¾ in.
Width of body over all	7 ft. 6 in.
Height from floor to underside of roof ...	6 ft. 9 in.
Seating capacity	28 persons
Floor height above ground (no passengers)	34 inches
Floor height above ground (loaded)	32 inches

The underframe is of composite construction, the side sills being of yellow pine, end sills of oak, and crossings of channel extending the full width of body and connected to side sills by means of angle brackets.



Interior of Brill Trolley 'Bus.

The corner and side posts are of ash, with letter panels of yellow poplar securely bolted to the posts, and ash belt rails, extending full length of body. A side sheathing to the body is of No. 18 sheet steel.

A plain arched roof extends the full length of the body, and in addition to the wooden rafters the roof is strengthened under the trolley base with steel rafters placed to best advantage.

Positive ventilation is provided by means of louvres at the front and rear of the body. The front louvres are equipped with shutters for regulation, whilst the rear louvres are without shutters, and act as exhaust ventilators when the shutters in the front louvres are closed.

A two-leaf folding door placed at the front end is operated by the driver from his seated position. The doors are of ash with the lower portion glazed with clear wire glass and the upper portion with double strength glass. The doors fold outwardly against the body corner post. Double steps are provided at the door opening, the steps being supported by steel step risers securely fastened to the body. The height of the first step above the ground is 13 in. when the vehicle is empty, the other steps having a 10½ in. rise.

Bronze metal trimmings are used on the interior of the body. There are eight windows on the off side and seven on the door side, all fitted with single sash arranged to drop into pockets in the side of the body. At the rear end there are three windows, the two at the side being arranged to drop. At the front there is one sash hinged at the top, similar to standard wind shield practice. The best grade of heavy wind shield fixtures are used.

All the window sashes are glazed with double strength glass, the side sashes having one lift at the bottom and

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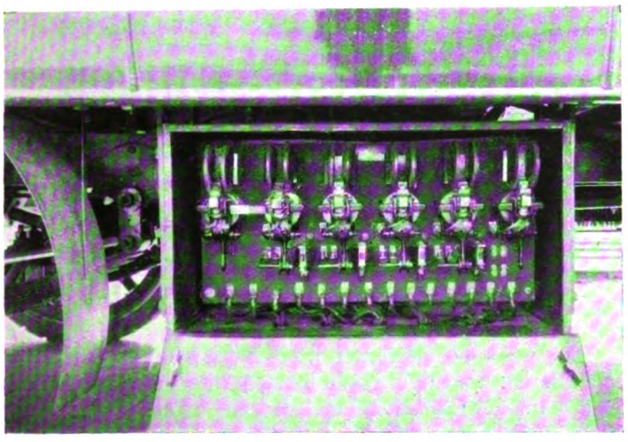
two at the top. The inside finish of the body is of ash, including all doors, linings, and mouldings, while the ceiling is in carline finish of white enamel. Each side of body has advertising mouldings arranged to take 11 inch cards, and each side below the belt rail is provided with sheathing.

Seat rests are of wood, and the inside lining below the seat rests is of poplar. The driver's seat is fitted with a special back, adjustable to suit the operator. All seats and backs are covered with black imitation leather, and are spring upholstered. The length of the cross seats is 31 in., the width of the aisle 19½ in.

Each side window of the body is furnished with curtains of pantasote mounted on suitable spring roller fixtures. No curtains are provided to the windows at the rear of the body, but there is a suitable curtain of pantasote at the front end at the back of the operator, to prevent the reflected light from the body interfering with the vision of the driver. An emergency door at the rear gives an exit for passengers in case of accident, the section of the rear seat in front of the emergency door being removable. This seat when in place forms a permanent lock for the door, and must be removed before the door can be opened.

Two headlights of standard automobile type are supplied, and there are two lights located on the rear of the body just below roof line, equipped with semaphore ruby lens. The body is lighted by six lamps of sufficient candle power to permit passengers to read. Other fittings include a horn of the Klaxon type or equal, a combination speedometer, indicating speed and miles travelled, an illuminated destination sign of standard make, a mirror in front of driver giving him complete view of interior of body, and a standard make of rain shield located over driver's window to ensure safety when driving in inclement weather. The car is equipped with four single coil 500-watt electric heaters, located along truss plates under seats.



Magnetic Contactor Panel for Automatic Control—shown in Position Under Railless Trolley Car.

Automatic Control.

One very important feature of the Brill car is the development of automatic control. The old type of vertical drum control, as on tramcars, was discarded in view of the fact that both hands were necessary for steering. In earlier designs the plain, manually-operated drum controller, mounted on the car floor and operated by a system of rods and toggle joints, showed that on account of the wear of the various parts it was impossible for the operator to "feel" with the foot the various positions of control.

It was decided therefore to adopt complete automatic control for the Brill railless trolley car. This control is of the selective series relay or current limit acceleration type, which means that the motor would always be accelerated with a constant current regardless of the load. The control is designed so that the operator has available three separate running speeds.

The equipment furnished consists of a foot-operated enclosed master switch, mounted on the floor to the left of the steering wheel, with a release operated by a spring which returns the switch to the off position. This switch is mechanically interlocked with the reversing switch, which is mounted underneath the car and operated by a projecting handle so designed that the handle cannot be removed unless the reversing switch is in the neutral or off position, thus providing complete safety.

The magnetic contactor panel shown in the accompanying illustration is enclosed in a waterproof case, mounted underneath the car. A set of grid resisters mounted underneath the car in open frames is also furnished. As will be seen from the photograph, the contactor panel consists of an asbestos board of proper strength and moisture-resisting quality, which supports a row of six magnetic contactors each provided with railway type magnetic blowout. Two of the contactors handle the main-line current, completely disconnecting it in the off position. The remaining four contactors are used for current limit acceleration as previously described.

To prevent any possibility of contactors closing in any but the proper sequence due to irregularity of the roads, neutralising springs are provided on each contactor, together with a progressive electrical interlock. The contactors consist of a pressed steel frame and of an impregnated shunt coil of the continuous duty type. Main contacts are easily renewable. The switch, which is designed with very light weight, is speedy in operation.

Acceleration and Emergency Braking.

In order to provide sufficient torque for ensuring complete acceleration of the motor, a bypass push button is mounted on the car directly in front of the operator. Its purpose is to bring in the necessary acceleration switch in case extra torque is required for climbing a steep grade. The acceleration period is based on a rate of 1½ to 2 miles per hour per second on an average level pavement. To secure this it is only necessary for the operator to press the pedal all the way down whenever he wishes to start the vehicle, while it is possible quickly to avoid danger of collision in any traffic jam by resorting to the bypass button, which makes available the emergency torque of the motor. Its use, of course, is not required for average running conditions on an ordinary grade.

The automatic control just described was installed on the Brill trolley omnibus in connection with the G.E.-258-D commutating pole, railway type of motor, rated at 25 H.P. at 600 volts for continuous operation with a 65 deg. C. rise. The ultimate control selected for this type of work is as simple as possible, and requires the least amount of space in the cab about the operator. It is light in weight, and mounted where convenient for regular inspection of the master contactor panel to take place.

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LEEDS RAILLESS TROLLEY TRACTOR.

DOUBLE-DECK VEHICLE CAPABLE OF RUNNING ON TRAMWAY OR RAILLESS ROUTES.

The era of dear materials that has followed the war has led to increased attention being given to the claims of the railless trolley car. Previously its value as a complementary service to tramcar routes had been recognised, but there are now authorities in the tramway world who are inclined to anticipate that the railless electric vehicle with a large seating capacity will eventually supersede the rail car on some routes where repair of permanent way is required, the cost of renewals now being so high as to make the authorities hesitate before proceeding with track reconstruction.

The design of the trolley omnibus, however, has not previously been towards replacing the rail car by providing seating accommodation of the same capacity, a vital element in road transportation. The rear driven type, too, would not allow a sufficiently low overall height being obtained with a double deck body and to have the upper deck covered in. The low overall height was necessary not only to inspire confidence as to its safety, but to be able to pass under bridges from 14 ft. 6 in. upwards in height, the low bridge being in great evidence up north. Safety in design of a public vehicle is of utmost importance if prospective passengers are not to be kept away.

The foregoing vital issues have been taken into account in the design of the "front drive" trolley vehicle with drop chassis, the patent of Mr. G. A. Bishop, of the Electric Traction Company, Hepworth's Chambers, Briggate, Leeds, and designed under the superintendence of Mr. J. Wright, engineer. This car is now running in service in Leeds, and giving satisfaction. Fig. 1 shows this 59-seat vehicle with the fore-carriage dash removed.

The body is a double decker, with top canopy, and the seating capacity of 59 is in addition to the driver and conductor. The saloons are spacious, comfortably seated and admirably illuminated, the width of the upper saloon being 6 ft. 8 in. and the lower saloon 6 ft. 11 in., their respective heights being 5 ft. 9 in. and 6 ft., thus giving plenty of head room.

While intended primarily for railless routes, the car can be run from the ordinary tramway trolley wires along the tramway track, and when this is done one of the two trolleys generally used for the railless system is lowered and fastened, and the current is taken from one trolley, contact with the permanent way being effected by means of an iron shoe or "skate" attached to the frame members of the chassis, which runs in the groove of the rail, thus providing the necessary earth contact.

Fig. 1.—Leeds City Tramways Railless Trolley Tractor, with Fore-carriage Dash Removed.

The principle of the front drive is that of a tractor, the driving unit being on a fore-carriage, and the motors are carried fore and aft of the front axle, being supported at their outer ends by coil springs bearing on the fore-carriage frame. Each motor drives one of the front road wheels, the drive being direct through a pinion on the motor shaft, and internal gear ring fixed in the wheels, the gears running constantly in oil. By this simple construction all cardan shafts, gear chains, differentials, and their relative connections are dispensed with, whereby power is saved and depreciation minimised. The controller and resistance for the motors are fitted in the driver's cab, together with the steering gear and brake controls.

A salient feature of the "front drive" system is the ability to remove and replace the whole driving unit by merely undoing eight bolts attaching it to the main frame channel members and sliding out endways, the time taken in withdrawing and replacing the unit being about two hours. This is certainly a unique

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development, as by having one or two spare fore-carriages it is possible to keep running a very efficient service, and a breakdown of a vehicle in service need

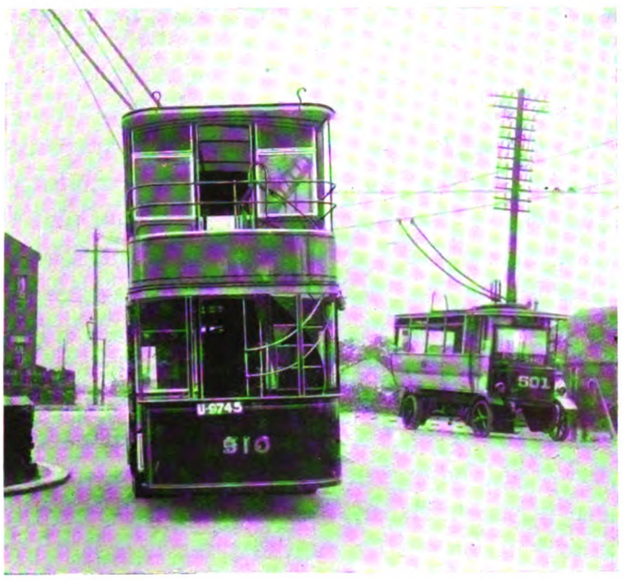

Fig. 2.—Rear View of Leeds Railless Trolley Tractor.

not keep it off the road any appreciable length of time. Irreversible steering has been obtained by means of a worm and worm rack, by which the turntable and fore-carriage are rotated, and from exhaustive tests it has been proved that no obstacle in the road, placed in the path of one of the front wheels, can deflect the line of motion of the vehicle even were the driver not holding the steering wheel.

Placing the whole of the driving unit at the front has enabled a drop frame to be used, giving a reduction of over 2 ft. in height, the height from ground to top of canopy being approximately 13 ft. 10 in. Obviously this gives a low centre of gravity, being 47 in. from the ground when empty and 61 in. fully loaded, and as comparison, assuming the same body to be mounted on the early rear-driven railless chassis, the centre of gravity would be 6 ft. 6 in. from the ground when fully loaded.

This correspondingly increases the factor of safety for a double-decked vehicle running on an ordinary road surface, and also makes it possible to do away with the steps from the ground to the rear platform, a height of only 14 in. with the omnibus unloaded, which is a most important factor from the passenger point of view by facilitating rapid and safe egress and ingress. Fig. 3 shows the elevation and plan of the chassis, while Fig. 2 indicates the safety properties of the low frame and the wide staircase.

Special attention has been given to the easy riding of this new railless omnibus under light and heavy loads, the rear springs being fitted with a shock absorber device, undue oscillation being entirely eliminated. Thus the vibration which one has been accustomed to in the rear driven type due to the method of power transmission is absent altogether by having the driving mechanism at the front. A notable result of this is the ability to use metal filament lamps successfully in place of the usual carbon type for illuminating.

Another point worthy of note is the braking of all four wheels, the road wheels being of the usual hollow spoked type but with a disc, all being interchangeable. The brakes are three in number, a hand brake on the front wheels and two internal expanding foot brakes on the rear wheels, one of which is controlled by a ratchet device, to hold the 'bus when on an incline.

The "front drive" combination was fitted to one of the earlier railless vehicles used on the Leeds system and has been running since January 1920, proving very satisfactory. The cost of maintenance, we are informed, is less than the other type of railless vehicles.

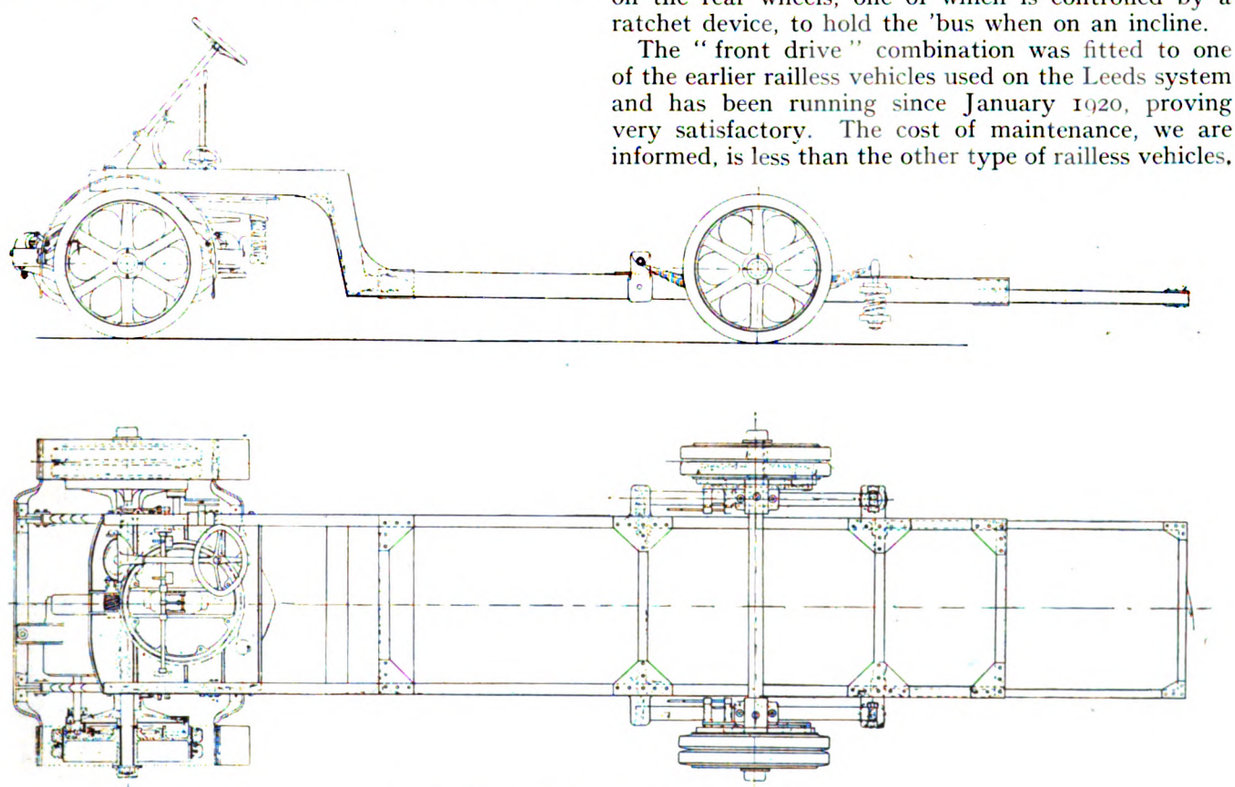

Fig. 3.—Side Elevation and Plan of Chassis.

By adopting the "front drive" system, the necessity of maintaining a separate department of highly skilled fitters is eliminated, as the "front drive," being purely tramcar practice, enables the work to be carried out by the usual tramway staff.

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THE
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LONDON, DECEMBER 15, 1921.

Statutory Burdens.

Constituents of the Municipal Tramways Association have reason to be pleased with the persistency shown by the Executive Council in endeavouring to relieve tramways of burdens entailed by legislation unsuited to the present era. One is the obligation, handed down from horse-car days, to repair tracks and margins; another is the excessive rates levied on the track. The incidence of this expenditure falls more unjustly in view of the fact that the benefit is shared by other vehicles, especially heavy mechanically-propelled machines whose drivers show a partiality for the best paved portion of the thoroughfare. Another point of contention is the facilities given by the Roads Act 1920 to omnibuses run in competition with tramways. So far the Association have been unable to secure redress either from Parliament when the Roads Act was under consideration or from the Ministry of Transport since it has been in operation. The various points were well emphasised in two papers read at the September conference, but the conference decided to ask in the public interest only for statutory regulation of competing traffic. This restriction should not, however, prevent enumeration of the reasons upon which it is based when representations are made to the Ministry. The Executive Council will have seen by this time that their case is sympathetically regarded by the Director-General of the Roads Department. Speaking at the Bristol Conference of the Commercial Motor Users' Association, Sir H. Maybury observed that a matter which must engage the attention of the Ministry was the burden placed upon tramways for road maintenance and repair, a burden that had largely increased. Sir Henry insisted, however, that as the matter is a statutory one the undertakings must go to Parliament for relief, and that if it is obtained they could not expect to pay only hackney carriage licences, but would have to be taxed according to the carrying capacity of the vehicles. It is satisfactory to note that on the same occasion the hardship placed upon the tramways was also referred to by Mr. W. G. Verdon Smith, chairman of the West of England Division of the C.M.U.A., and managing director of the Bristol Tramways and Carriage Company. We venture to add that Sir H. Maybury's views will not be unacceptable to tramways administrators, for they desire nothing more than to be taxed on the scale applicable to omnibuses. There is another direction in which tramways can perhaps secure relief. It is by individual action with assessment committees to secure reduced assessemnt. This opening should especially appeal to undertakings that have had to obtain a grant from the rates.

First Essential of Employment.

The whole transport industry is indebted to the London General Omnibus management for the sentence with which they concluded their notice to their employees of the adoption of the revised terms of employment arranged with the representatives of the men's union. It reads thus—"The company hopes that the drivers and conductors will realise that those engaged in transport must regard the furnishing of necessary public facilities as the first essential of employment, and that they will accept these altered conditions as being the best the company is able to provide." Although the justification of the company's ultimatum was acknowledged by a majority of over a thousand on a poll of over 80 per cent., the fact that four thousand of the

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men constituted the minority shows that their appreciation of the facts of the industrial situation is still inadequate. The whole of the manufacturing industries of the country have acknowledged, by acceptance of wage reductions, that trade cannot be carried on, much less increased, without a great reduction of wage costs. That recognition has so far been shared by tramway employees to the extent of two reductions totalling five shillings. No such reductions have been made in the wages of the London omnibus drivers and conductors, although all other grades in the company have submitted to the inevitable fall. Yet as many as four thousand of these two classes objected to their eight hours of duty being performed in a spread over of twelve hours as concerns only 25 per cent. of the scheduled duties, instead of in ten hours, as has been the case since 1919. In plain English, the dissentients refused to enable their employers to cater efficiently for the traffic except by adopting the impossible step of greatly increasing the number of men employed. Such ignorance of the economic situation leads one to ask whether the men are aware of the financial results of London omnibus working during the past few years. Under such circumstances it is well that they have been reminded of the basic condition governing the employment of all passenger vehicles employees. The reminder is not without interest for tramway employees in view of the request of the undertakings for a revision of the national agreement entered into in March 1919, which guarantees a working week of 48 hours. Associated with that agreement were conditions which have been the subject of 150 separate interpretations. Owing to the demands of the traffic, tramway employees have not enjoyed so short a spread-over as that of the London omnibus workers, who have no workmen's traffic to cater for; and at present there is no indication that the financial position of the industry will permit of Utopian conditions of employment.

An Unwarranted Conclusion.

That a little knowledge is dangerous is exemplified by a newspaper paragraph summing up the prospects of Private Bill legislation as not being likely to cause elation among members of the Parliamentary Bar. The excerpt referred to reads, "The decline in the popularity of electric tramways is indicated by there being only two cases in which powers are sought for extensions or new routes, while applications for motor omnibus powers or extensions of powers appear in several municipal measures." What our contemporary is apparently not aware of is that the cost of materials and labour has not yet fallen to the extent necessary to warrant tramway construction as a business proposition. The writer might just as well assert that British manufactures generally have lost popularity because of the alarming falling off in exports. Here, too, the cause is identically the same: the country is unable in the present economic position to offer to foreign nations its products at prices which they can afford to pay. Or the paragraphist might have declared that houses have become unpopular because the Government have vetoed further building until costs have fallen substantially. Nor is it a question of omnibuses ousting tramways, as the writer seems to imagine. Writers in several newspapers may be excused for not knowing that tramways and omnibuses (petrol and trolley) have distinctive spheres. The two latter forms of traction have a special place as machines for testing traffic capabilities and for working up a traffic heavy enough to warrant the laying down of rails. There is a promise, too, that the railless trolley car is likely to become even more valuable than it is in single deck form for taking care of a traffic that it has served to develop. At Leeds there is in operation a double-deck car—which is described elsewhere in this issue—that, by reason of the adoption of front wheel drive, has the centre of gravity so low that no objection could be taken to roofing over the top deck. Besides having the advantage of the cheapest form of traction, the car will thus be able to carry the maximum load in wet weather, in strong contrast to the double-deck omnibus. In London the latter vehicles have hitherto lost half a million passengers on a wet day, though the partial reintroduction of the longer penny fare on December 1 increased the number carried by 43,000 more than the normal average on a rainy day. If testimony were needed that tramways still

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have their place it is to be found in the Bills promoted by Bristol Corporation for constructing three new tracks in the city, including one to Avonmouth Docks. Further, the Bristol Tramways and Carriage Company are seeking an extension of the time for the construction of tramways authorised as long ago as 1904, and for the compulsory purchase of lands authorised in their Act of the same year. The company, besides being the operators of the Bristol tramways, are the owners of the largest provincial omnibus undertaking. Yet both company and municipality favour further tramway construction.

CORRESPONDENCE.

"TROLLEY OMNIBUS DEVELOPMENTS."

To the Editor of "THE TRAMWAY AND RAILWAY WORLD."

Sir,—I was indeed interested to read in your November issue an article on "Trolley Omnibus Developments." The information contained in this account of the new "Straker-Clough" production appeals to me perhaps slightly more forcibly than many others who are interested in railless traction, as this trolley omnibus is the direct outcome of actual experience gained by my Board in the running of such vehicles. It has been obvious to us for some time that the one great drawback to this method of traction was the excessive cost of maintenance, due principally to the difficulty in obtaining spare parts and to the high cost of these spares. As the outcome of this defect, the general manager, Mr. J. B. Parker, set himself to design a trolley omnibus which would be thoroughly reliable, carry the maximum number of passengers—thought for their comfort being given careful consideration—in fact, a vehicle which could be put on to the road and efficiently run, electrically and mechanically, at the lowest possible cost. Several different types of chassis were inspected and examined, and the final selection of the Straker-Squire chassis, as used on the London omnibus, was, to my mind, a wise one, as the experience this firm has had in designing is of premier importance. The foot-operated controller with one motor has proved itself to be superior to the hand-operated two-motor type; the car driver who has to attend to the ordinary tramway controller and a steering wheel at the same time undoubtedly has both hands full; thus the deletion of the hand-operated controller is certainly an event in railless traction. The inclusion of standard mechanical parts in the omnibus is a salient feature, and it was this that originally prompted Mr. Parker to put on to paper the design that has now materialised.

Although this vehicle has not yet had a long trial on the road, I am inclined to agree with the writer of the article that we are on the eve of great developments, and that the "Straker-Clough" trolley omnibus, which is the result of actual experience, will prove itself a great success and will appear on the roads where the rail tram and the petrol omnibus now run.

Yours faithfully,

WILLIAM G. GRACE,

Chairman, Tees-Side Railless Traction Board.

Westcroft, Eston,

Yorks., November 23, 1921.

"SCRAP THE TRAMCAR."

To the Editor of "THE TRAMWAY AND RAILWAY WORLD."

Sir,—After reading with interest in your issue of October 20 last the letter on "Scrap the Tramcar," it appears to me that your readers will, after having read this letter, unless they are conversant with the running of tramcars and trolley omnibuses, be tempted to come to the conclusion that the petrol omnibus is the passenger-carrying vehicle of the future (irrespective of the number of passengers to be catered for). Therefore before taking the matter seriously further consideration and investigation should be made relating to the running of the tramcar and trolley omnibus.

Respecting the provincial omnibus company, whose profits averaged 35 per cent. for the past eight years, it would be interesting to see the working cost, receipts, and the fares charged per passenger per mile, and to compare same with those of a tramway or trolley omnibus undertaking. Such figures would no doubt be of great assistance to interested parties who are contemplating extensions to, or the conversion of their present systems by a cheaper and a more efficient means of transport.

There is a lot to be said in favour of each type of vehicle, and without doubt there is a place on the road for each, where they can be efficiently run, to be self-supporting and to the greatest public convenience. The question which arises is, "Where shall each type of vehicle run to be the most efficient and economical, and to meet the demands of the travelling public with the cheapest fare?" It is obvious that where the different types of vehicles are run in direct opposition on the same route a great amount of energy is wasted (which has to be paid for); therefore to give the passenger the cheapest ride possible, the only solution is to set out the routes and adopt the type of vehicle most suitable for each particular route.

One of the main causes for the deficiencies in receipts relating to the tramcar at present is the fluctuation in the number of passengers carried, due to the intrusion of other types of vehicles which only run occasionally, without any guarantee, and at such times when the tramcar could get extra fares.

If this duplication of vehicles, which causes a great amount of wasted energy, could be abolished, then the tramcar, with all its high capital expenditure in track, would again pay its way, with cheaper fares than any other means of motor transport, providing that its route had sufficient population to demand a service of which a tramcar is capable. If not, the trolley omnibus would be the vehicle to adopt until such times as the traffic demanded a tramcar service. The petrol omnibus is no doubt the vehicle for opening out and linking up the sparsely populated districts, and as a feeder to the trolley omnibus and tramcar routes.

Referring to the trolley omnibus in particular, this form of passenger vehicle has not yet had a fair chance for development, although the time appears to be drawing near for its more universal adoption. Previous to the war several Corporations had them installed in conjunction with their tramways systems, and it is noteworthy that these Corporations have been of late, and are at present extending their systems with this type of vehicle. Surely this would not be the case if the trolley omnibus had no merits! Further, with the experience gained by the two years' running of a self-contained trolley omnibus system, the writer—who has been responsible for its development during the last eighteen months, and who has had many years'

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previous experience in the running and maintaining of a tramway and motor omnibus system on a large scale—has further developed the trolley omnibus system with an entirely new design of vehicle which embodies all the main features of the tramcar and petrol omnibus, with the object of obtaining the very best results, with simplicity and low running costs.

The design of the vehicle has been thoroughly gone into, so that spare parts can readily be acquired when necessary. The chassis adopted is a standard commercial petrol chassis of noted make (less engine clutch and gear box), which is fitted up electrically with a single 40-H.P. railway type electric motor, built by an experienced and well-known firm. The resistance is of the unbreakable type, and the controller of simple design, operated by foot control. The trolley collectors are of the twin type, and allow the vehicle to deviate 14 feet on either side from the centre of the road. This combination, when a well-designed body is fitted, gives a most desirable effect. The comfort, silent and smooth running, is very noticeable, and above all it possesses the most important features of reliability and cheap running costs.

Yours faithfully,

J. B. PARKER
General Manager.

Tees-side Railless Traction Board
Middlesbrough Road
South Bank, S.O.

To the Editor of "THE TRAMWAY AND RAILWAY WORLD."

Sir,—May I crave your courtesy to reply to two letters which appeared in your issue of November 17 dealing with this subject.

In my letter I was careful to avoid reference to any particular make of petrol-driven omnibus, and it is unfortunate that because there are only a limited number of makers of trackless trolley omnibuses that my arguments were, of necessity, more personal in that direction.

A fair amount of statistical information is available to the public through the technical press and from various published accounts in local papers, and I have yet to learn that any figures are available which show that, taking average conditions with average current costs, that the trackless trolley omnibuses can be operated more cheaply than petrol omnibuses. I have also to learn that the average takings of trolley omnibuses or electric omnibuses are as high as those of petrol omnibuses, and I believe that this is due to the fact that they cannot be overloaded to the same extent and they cannot be adjusted for use on the most paying route. I go further, and say that I believe after investigation that on starting a new route not specially favourably situated as regards a generating station, that the annual charges in respect of the capital involved for feeder cables, trolley lines, standards, and other equipment, together with the maintaining thereof, will be as high as the capital charges in respect of a complete motor omnibus equipment.

Mr. Clough's letter is a very fair one, and I would not for one moment suggest that there are not a few special circumstances where the trolley omnibus might be indicated in preference to a petrol omnibus, but I submit that these instances are extremely rare. Is it not a fact that an up-to-date trolley omnibus exceeds the legal tare weight ?

Coming to Mr. Harvey's letter, I am accused of not having considered properly the capital charges. I happen to have before me the figures of a particular town where a re-laying scheme is under consideration. The cost of renewal is apparently about normal, viz., about £7 per lineal yard of single track. This works out as an extra charge on the undertaking per annum equal to half revenue; in other words, 10d. per car-mile.

I do not say that in all cases municipalities should immediately scrap their tramways system and substitute motor omnibuses, but I do say that there are cases where, having regard to their sinking fund obligations, it would pay them well to do so, and I say that before any municipalities re-lay any route they should go very carefully into what can be done for them by the motor omnibus builder, because I am quite certain that we can produce figures to any manager or tramway committee which would be financially convincing.

Mr. Harvey suggests that it will not be wise to change the route of a service continually. I said, and maintain, that it is an enormous advantage that the petrol omnibus has over either of the other systems in that the route can be varied. For instance, I can cite a particular case that I have in mind at the moment, and there are no doubt dozens of others, where a tramway route was put in to serve a colliery neighbourhood. Very soon after the completion of the route the colliery was entirely closed down, and the route cannot be operated now except at great loss. Now, a motor omnibus could have been diverted to run on some other route to serve some other colliery which was developing. The Parliamentary powers to run omnibuses are much more elastic than in the case of a fixed track.

Very often a new town planning scheme develops an area between two radial roads, and another intermediate road gradually develops into the more important thoroughfare ; when such a development has reached a certain stage, it would pay to move the transport route on to the new road, but such, of course, cannot be done when there is a permanent way to consider. Again, in developing a new route it is quite possible that a mistake might be made, which cannot be rectified when the tramway has been installed.

Further, far more traffic can often be got with a given number of vehicles if they can be distributed so as to cover an area fairly completely. On account of cost, the tramcars have to be confined to definite routes, with the result that a considerable proportion of intermediate traffic has inevitably to be abandoned. The motor omnibus, on the other hand, instead of giving a 10 minutes' service on one route, can equally give a 20 minutes' service on two adjacent routes without any extra expense, and gain perhaps an extra 10 per cent. or 15 per cent. of passengers thereby.

Mr. Harvey further says that the trackless trolley omnibus is as mobile and can make as good an average speed, and presumably carry as many passengers per car-mile per day, as the petrol omnibus. I absolutely disagree with him on this point, and if any tramway manager will write to my firm asking for a demonstration to the contrary, we shall be very pleased to arrange to put one of our standard omnibuses on a trackless trolley route.

The above offer is a fair one, and I am sure that any manager or chairman of a tramway committee who is interested will decide to avail himself of it, and that it will be a very much more satisfactory way of arriving

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at a decision than will a long correspondence carried on in your columns, even if you were willing to devote so much space to the subject.

I believe that the trackless trolley omnibus has nearly all the disadvantages of the tram, very few of the advantages of the petrol omnibus, and that it is more expensive to instal; that is in a general way. There are, of course, exceptions to every rule.

Yours faithfully,

C. B. NIXON.

Leyland Motors, Limited,
Leyland, Lancashire, December 7, 1921.

TRAMWAY AGREEMENT OF MARCH 1919.

SPECIAL CONFERENCE OF THE M.T.A. DECIDES IN FAVOUR OF REVISION.

A special conference of members of the Municipal Tramways Association was held on December 9 at the Surveyors' Institute, Westminster, S.W., for the purpose of seeking a way out of the difficulty which has arisen over the proposed revision of the March 1919, working agreement. Alderman R. Mayne (president of the Association, and chairman of the Newcastle Transport and Electricity Committee) was in the chair, and there was a large attendance of delegates representing practically all municipal undertakings. A deadlock had arisen in consequence of the refusal of the employees' representatives on the National Joint Industrial Council to consider any revision of the 1919 agreement unless an undertaking was given that the guaranteed working week of 48 hours would not be interfered with. The employers' representatives could not concur in such a stipulation, and in these circumstances it was thought desirable to place the matter before a representative gathering of municipal employers. After some discussion, the following resolutions, moved by the president, and seconded by the vice-president (Councillor J. Timpson, chairman of the Portsmouth Corporation Tramways Committee), were passed with practical unanimity:—

(1) That this Association is recommended not to interfere with the normal working week of forty-eight hours.

(2) That this Association is in favour of the request made by their representatives on the National Council that a committee of that Council should be appointed to consider and revise the whole of the terms of the agreement of March, 1919.

(3) That in the case of the employees' representatives refusing to agree to appoint that committee with such a reference, this Association agrees that notice should be given forthwith to terminate the agreement of March, 1919.

The National Joint Industrial Council for the tramway industry meets on Thursday, December 15, at 6 Richmond Terrace, S.W.1. Among the matters to be considered will be a proposal from the municipal employers' representatives that a special committee be appointed to consider the revision, as a matter of urgency, of the March 1919, agreement. This proposal will be submitted in order to afford the Council an opportunity of reconsidering the proposal submitted by Mr. Spencer at the last meeting.

NEWCASTLE EMPLOYEES' WORKING HOURS.

REVERSION TO 48-HOUR WEEK.

Newcastle-upon-Tyne City Council on December 8 decided to rescind a resolution passed by them in February, 1919 restricting the working hours of their employees to 44 per week. The result is that the working week of the tramway employees will now be about 48 hours.

Alderman R. Mayne (chairman of the Transport and Electricity Committee) moved the resolution of that committee recommending the Council to rescind the resolution of 1919. He spoke purely from the point of view of the tramways, which for the past few years had only been making ends meet, and whose reserve fund in the past two years had decreased from £107,000 to £66,000. The only way out of their difficulty was to take a long look ahead and either increase their revenue or decrease their expenditure. He deprecated an increase of fares as "absurd," as well as poor economy. Wages of the tramway workers had not fallen to anything like the extent of those of workers in a comparable class in the district. A half-hour extra on each shift would about bring them to the 48-hour week agreed on nationally for tramway workers. There was only one other tramway concern working on a 44-hour week. That was at Erith, and it took from the town a rate of 1s. 8d. in the £. Extension of working hours might mean an increase of unemployment, but Alderman Mayne thought the danger of greater unemployment would be more pronounced if they increased the fares. They could approach the men in such a way that the committee would not have to discharge anyone in their employment. He added that there was a justifiable public demand for a car service to run an hour later at night than at present.

Alderman Morton seconded, and Mr. G. Nixon moved to ensure that under this resolution no employee should be discharged. Sir Arthur Sutherland suppported, and said one cause of unemployment was the short hours, and the fact that men were not giving value for the money received. Thousands of pounds worth of work had been sent away from the Tyne in the past six weeks owing to high costs. By reduced wages or increased hours and production work might have been retained.

Labour members strongly opposed the resolution on the ground that it must inevitably increase unemployment.

The committee's resolution was carried by 46 votes to 17, and Mr. Nixon's supplementary motion was also passed. On the previous Saturday a mass meeting of the Newcastle Corporation employees carried a resolution strongly protesting against the action which the Council has now taken, and pledging the employees to resist it by every means in their power.

TRAMWAY LEGISLATION.

PARLIAMENTARY BILLS IN NEXT SESSION.

Among the Private Bills which had to be deposited at the House of Commons on or before November 30 last for consideration in the next Parliamentary session, were several that contained clauses relating to tramway extensions. On the whole, the number of Bills showed little advance on that of last year.

The Nottinghamshire and Derbyshire Tramways Company will seek power to construct additional tramways in the urban district of Heanor, the rural district of Basford, and the borough of Ilkeston. The first work will be partly tramway and partly tramroad, and will commence in Market Street, Heanor, from a junction with the existing tramway near the intersection with Wilmot Street, passing thence along Church Street and across Ilkeston Road. The line will then pass through private lands, crossing Ella Bank Road and Breach Road, and terminating at a point on the boundary between the urban district of Heanor and the rural district of Basford.

The second work will be a tramroad wholly in the parish of Shipley, in the rural district of Basford, commencing by a junction with the last-mentioned tramway at its termination, and passing thence in a south-westerly direction through private lands under the mineral railway from Woodside Colliery to Shipley Lock, crossing the private road leading from Long Lane Lodge to Shipley Gate Station, and terminating near the northern corner of Cotmanhay Wood. The third work will be partly tramway and partly tramroad, wholly in the parish and borough of Ilkeston, commencing by a junction with tramway No. 2 at its termination, and passing thence in a south-easterly and southerly direction through private lands, crossing Church Street and Bridge Street, to and terminating in Cotmanhay Road by a junction with the existing tramway of the company near Church Street and Bridge Street. The company will also seek power to alter the gauge of their tramways in the borough of Ilkeston from 3 ft. 6 in. to 4 ft. 8½ in.

Bristol Corporation have presented a Bill embodying clauses for the construction of new tramway routes within the city. One will commence in the new road from Hotwells to Avonmouth, now in course of construction by the Corporation, by a junction with the tramroad authorised by the Act of 1920, at a point south-east of the junction of Cook Street with Avonmouth Road, passing thence along Avonmouth Road, Richmond Terrace, and Richmond Road, and terminating in Kingroad Avenue, near the south entrance gates to the Royal Edward Dock. A second tramway will commence in Avonmouth Road by a junction with the last-named proposed line, near the junction of Green Lane and Avonmouth Road, passing thence along St. Andrew's Road and terminating there. A third new line is contemplated, commencing by a junction in Avonmouth Road with tramway No. 1, near the junction of Gloucester Road and Avonmouth Road, passing thence along Gloucester Road and terminating there at the entrance gates of Avonmouth Docks. Provision is also made for a service of railless trolley vehicles along the new road in course of construction; also along Avonmouth Road, Richmond Terrace, Richmond Road, Kingroad Avenue, and Gloucester Road, etc. The Corporation will be authorised to carry passengers, luggage, goods, animals, and parcels.

The Bristol Tramways and Carriage Company will promote a Bill for an extension of time for the compulsory purchase of lands and for an extension of the time limited by the Order of 1921 for the construction of tramways authorised by the Act of 1904.

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EDINBURGH CORPORATION TRAMWAYS.

A Report by Mr. R. S. Pilcher,
Manager of the Corporation Tramways.

The following report showing the policy already decided upon by Edinburgh Town Council, the extent to which it has been carried out, and what remains to be decided has been submitted to the Town Council by the tramways manager, Mr. R. S. Pilcher—

In considering the question of the conversion of the tramways undertaking and the policy to be adopted in the future, it is necessary in the first instance to review briefly the policy which the Corporation has adopted during the last few years with regard to the tramways undertaking. During the currency of the Tramway Company's lease of the undertaking, several reports were presented to the Town Council on the policy to be pursued when the lease ended, but no definite decision was come to until the issue of my report dated February, 1919, when the following recommendations contained in this report were, with slight modifications, adopted (April 9, 1919).

(1) That the cable system be discontinued.
(2) That the system should be electrified and the overhead electric system be adopted generally, subject, however, to separate consideration being given to special parts of the city.
(3) That Princes Street should be separately considered. In connection therewith, instructions were given to the tramways manager and the burgh engineer to report as to the costs of laying out and working alternative systems, and the respective advantages and disadvantages of such systems.
(4) That preparations for conversion and reconstruction should be made at once. An instruction was given to the tramways manager to report as to the car shed accommodation to be provided at Shrubhill. Instructions were also given to the burgh engineer and tramways manager to report generally as to permanent way, overhead equipment, and electric cables.
(5) That conversion and reconstruction should be carried out in sections, the first to be undertaken being the section from Pilrig to Liverton.
(6) That a tentative approval should be given to the extensions recommended in the tramways manager's report, on the footing that these should be considered in detail at a later date.
(7) That a number not exceeding 15 motor omnibuses should be acquired to supplement the present tramway service, and that application be made for the necessary Parliamentary powers to operate the omnibuses outside the city boundaries.

With reference to (1), (2), (4), (5) and (6), these recommendations could not be carried out until there was some prospect of obtaining a sufficient supply of electrical energy from the Electricity Department. As soon as intimation was received as to the probable date of supply, viz., the spring of 1922, the necessary arrangements were made for carrying out these instructions, and various reports have been submitted to the committee and the Town Council.

With regard to Parliamentary powers for the construction of tramway extensions, powers were obtained in the Edinburgh Boundaries Extension and Tramways Act, 1920, which contained the following extensions—

	Mile	Furlongs	Chains
Nether Liberton to Liberton ...	--	7	3·71
Seafield Road to King's Road ...	1	4	9·25

In addition the Corporation had previously obtained powers for the following tramways—

Murrayfield to Corstorphine ...	1	5	6

With reference to (7)—the policy of introducing motor omnibuses has been carried into effect.

Clause (3) deals with the policy to be adopted with regard to Princes Street. This question was specially dealt with in a report dated March 25, 1919, but no decision has been come to as to the form of construction to be adopted in regard to this thoroughfare.

ELECTRIFICATION OF THE SYSTEM.

In connection with the electrification of the system, the plan proposed and adopted was to deal with the undertaking in four sections, as follows—

1st Section—Pilrig to Nether Liberton, York Place and London Road, Grange Road.
2nd Section—Portobello route.
3rd Section—Princes Street, Braids, Craiglockhart, Murrayfield, Gorgie, Marchmont.
4th Section—Mound, Comely Bank, Hanover Street, Leith Street to Goldenacre.

The Corporation, on April 13, 1921, authorised the conversion to be commenced. In preparation for this work, the wood working and paint shops at Shrubhill have been enlarged and the machine shop has been added to.

With regard to the progress of conversion in connection with the first section, the following contracts have been placed—Extension of Leith tramway depot; extension of Shrubhill pits and new entrance, supply of overhead equipment materials, supply of electrical equipment for traversers, supply of permanent way junctions and points.

Thirty-seven car bodies are being reconstructed in Shrubhill workshops.

The first section of tramways should be operated electrically in May or June, 1922, when the following through routes with Leith will be put into operation—Liberton to Granton *via* Broughton Street, Newington Station to Stanley Road *via* Pilrig Street, Salisbury Place to Goldenacre *via* Broughton Street, Salisbury Place to Stanley Road *via* Ferry Road, Salisbury Place to Seafield, Post Office to Granton (circular route) *via* Pilrig, Post Office to Granton (circular route) *via* Bernard Street.

FUTURE POLICY.

The future policy, as defined by the Town Council, is the electrification of the rest of the system. I am of the opinion that the sooner this is dealt with the better. The costs of construction are coming down, and I believe that the public desire (and should get) an improved service over all routes at the earliest possible moment.

The section of Churchill route from Salisbury Place to Churchhill is part of the first section, and should be dealt with next. When this is electrified, a service could be run from the Post Office to Churchhill. The second section, viz., Portobello route, could be dealt with either concurrently or following the completion of the first section. This will make through running possible with Musselburgh. The third section, which includes Princes Street, could be dealt with next summer. Provision is made in the estimates for lowering the roadway on Gorgie route for top-covered cars. The fourth section included the tramway from Leith Street *via* Broughton Street to Goldenacre—this route has been added to the first section.

Of the other three routes—the Mound, Hanover Street, and Comely Bank—these routes were dealt with in my report on motor omnibuses, dated April 2, 1921, in which I stated—"On those routes where the omnibus is operating in place of the cable car, I am of the opinion that they should be continued until such time as electric traction can be introduced on a remunerative basis." This has become the policy of the Corporation.

ESTIMATES.

I append detailed estimates of the cost of converting the second and third sections of the tramways. The estimates are based upon the latest available prices, which are lower than the estimates presented in my last report, as the prices for most commodities have dropped. There is also the prospect of a still further fall in prices within the next 12 months. These estimates provide for the renewal of a considerable amount of permanent way, but although this is provided for it is not proposed to renew the rails before the electric system is working, and, even then, it may be possible to operate for several years before renewing the lines. In this connection, it is right to keep in mind that in each year of operation, the cable system requires to contribute £53,200 towards reduction of debt. At the end of last financial year the debt stood at £375,000. At the end of the present year the debt on the cable system should be approximately £321,800.

Is the cable system at present able to stand the additional capital expenditure proposed by the conversion of the remainder of the system? In answering this question, I wish in the first place to point out that the revenue and working expenses on the cable and electric systems are as follows—

	Year Ended 15th May, 1921		
	Edinburgh Cable System	Leith Electric System	Difference
	Pence per Car Mile	*Pence per Car Mile*	*Pence per Car Mile*
Working expenses ...	19·63	15·40	4·20
Revenue	24·87	19·80	5·00

As the cable system is changed over to the electric system, the cost of operation will be reduced to the level of the electric lines. This 4·2d. per car-mile on the whole of the cable system represents £98,000 per annum on the present mileage, 5,600,000 miles.

On the revenue side there is a difference of 5d. per mile more on the Edinburgh lines than on the Leith lines. These conditions, as regards revenue, should remain the same; if anything, the through running facilities should increase the revenue on both systems. In these circumstances, there is 4·2d. per mile, viz., the difference in the cost of operation, to meet the additional capital charges which will be incurred by the conversion of the system.

The estimated total expenditure on the three sections, based on the latest costs, is £648,711. The Corporation have power to write off this expenditure over a period of 30 years. The annual capital charges would be £44,635, equal to 1·91d. per car-mile, leaving £53,365 per annum to meet renewals and provide for reductions in fares, so that, from a financial point of view, it will pay to make the change as soon as possible. As a matter of fact, the Corporation must move in one direction or another—it cannot stand still. If the

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cable system were to be continued, provision would require to be made for the necessary renewals for continuing it. Instead of providing for this, it is better to convert, and when it is considered that all three systems, viz., electric, cable and omnibuses, are at present being operated on a remunerative basis, and that the costs of electrification will be spread over several years, there should be no hesitation in proceeding with the conversion of the remainder of the system in sections as indicated.

PRINCES STREET.

The question of the policy to be adopted in Princes Street has not been decided, except that it is to be electric traction, but it is necessary for a decision to be made now ; otherwise delay in settling this question will mean a certain amount of public inconvenience owing to the change of car between the cable and electric system at Waverley and the Post Office. If the Princes Street tramway is settled, the remainder of the system can be quickly dealt with. The different aspects of this question have been reviewed in previous reports, but I propose to refer briefly to some points which require consideration.

The question of removing the tramway from Princes Street to George Street has been proposed. This proposal may be made by those who are opposed to the erection of overhead wires, under any circumstances, in Princes Street, but, in my opinion, tramways should be continued in Princes Street, because it is the main and natural artery for the city's traffic, and also it is the thoroughfare where most of the citizens either wish to go, or to pass through. It is particularly wide, and suitable for tramway traffic ; it connects the two principal railway stations ; it is the point of the heaviest existing tramway traffic, and to remove this service to George Street would inevitably put the travelling public to a great disadvantage and deprive the tramway undertaking of the most natural route, putting it under a disadvantage compared with other competing forms of traffic, such as motor omnibuses. For instance, it would be quite unsuitable and inconvenient to divert the Liberton and Churchhill routes along South St. Andrew Street and George Street to get to the West End or the Caledonian Station. If tramways are to fulfil their proper function, they must not be placed under any disadvantage with other forms of conveyance.

There is no doubt that there is scope for a tramway along George Street, which could be used as an auxiliary route to Princes Street where certain routes, or certain cars, could be diverted at busy times. I refer to routes from Leith *via* Leith Walk and York Place, proceeding *via* George Street to Haymarket and Gorgie. In this way it would, in years to come, relieve congestion and benefit George Street as a shopping centre, without in any way interfering with the efficiency or the advantage of the tramway along Princes Street.

OVERHEAD SYSTEM.

There are several methods of erecting overhead wires in Princes Street, The method I have previously recommended was for the tramway track to be constructed on the south or garden side of the street, between the Scott Monument and the West End, with side pole and bracket arm construction. This arrangement has the advantage of giving a wider street for other vehicular traffic, and of placing the poles and wires in close proximity to the trees where they will be seen least. This proposal has the advantage that the new track and overhead construction could be erected without interfering with the operation of cable tramways, thus ensuring a continuous tramway service.

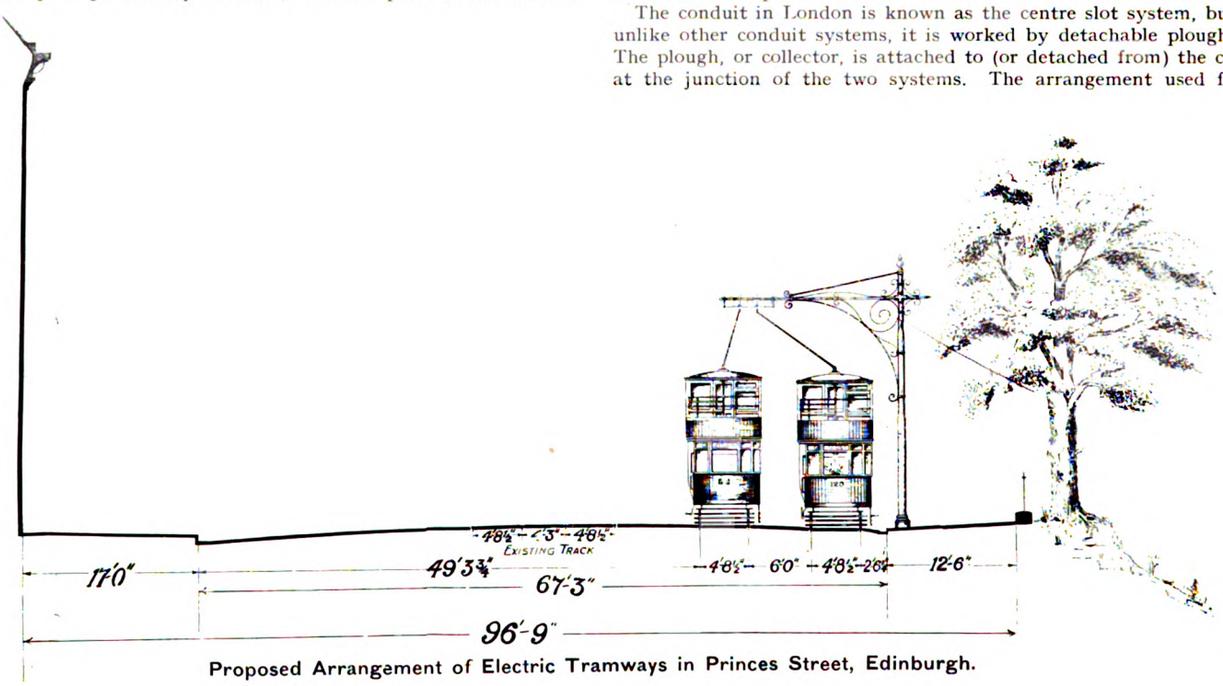
A second method would be to place the tramway track on the north side, but reserving a space of 9 ft. 6 in. between the rails and the curb for vehicular traffic. This would give a wide expanse of street for vehicular traffic, and would bring the cars nearer to the shopping side of the street. The form of overhead construction would be side pole and bracket arm.

A third method would be to leave the track in the centre and to erect centre poles. However, the width of the present clear way between the track is only 4 ft. 6 in., but even if sufficient clear way was made, the Ministry of Transport would not sanction the erection of centre poles in Princes Street, so that this proposal cannot be seriously considered. It is, however, practicable to erect the usual span wire construction, viz., poles on either side of the street with span wires. This would leave the track in its present position. I think that with such a width of street, 80 ft., the double row of poles, and the amount of span wires would affect the amenity of the street, and from this point of view it is less attractive than the scheme recommended.

CONDUIT SYSTEM.

There is only one conduit system being operated in this country, namely, the London County Council Tramways. The other underground systems which were in existence in Blackpool, Bournemouth and Wolverhampton, have been converted to overhead traction.

The conduit in London is known as the centre slot system, but, unlike other conduit systems, it is worked by detachable ploughs. The plough, or collector, is attached to (or detached from) the car at the junction of the two systems. The arrangement used for attaching and detaching the ploughs is ingenious, works smoothly, and causes only a slight delay, but it adds to the cost of operation, as it is necessary to employ two men at each change-over point The minimum number of change points which would be necessary for Princes Street would be as follows—Opposite the Waverley, South St. Andrew Street, Shandwick Place, Lothian Road.



Proposed Arrangement of Electric Tramways in Princes Street, Edinburgh.

I have investigated the Continental and American systems with a view to considering whether they would be suitable for adoption in Princes Street. Some of these systems are worked on the "side slot system," the conduit being placed by the side of the rail. All of these systems carry the plough on the car, and when the car leaves the conduit system the plough is raised by hand windlass by the driver, and lowered into the conduit when leaving the overhead system. Most of these arrangements are cumbersome, and are frequently the means of accident and delay through breakages to the ploughs. This system of ploughs was in use in Bournemouth when the conduit system was in vogue.

There is, however, another system of ploughs in use in several Continental towns, and notably in Brussels. This system is arranged so that each car carries its plough, but the plough is of a collapsible type, and operates very simply. The plough is lowered by the driver through the ordinary slot into the conduit and raised again when not required. The conductor changes the trolley at the change points, and then observes the plough to see that it has either properly entered the slot, or been wound up clear of the slot, as the case may be.

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There is no plough hatch necessary, and several cars can change over at the same time. This is a great advantage as, with a frequent service, delay is bound to take place if only one car can change over at a time, as is the case on the London system, and also on the other Continental systems. It has, however, the disadvantage of heavy maintenance costs. The manager of the Brussels undertaking thinks that the London system is better than the Brussels system.

The Municipal Tramways in Vienna used to have a conduit system in the centre of the city, a change-over being necessary between the overhead and the conduit systems. These change-over points and the conduit system were the cause of so much trouble that it has recently been converted to the overhead system. In Berlin the experience with the conduit has been unsatisfactory.

ALTERNATIVE SYSTEMS.

In considering the alternative systems, viz., overhead and conduit, it must be kept in view that the most efficient method of dealing with the problem is to adopt one system throughout, namely, the overhead system. To change from one system to another in the busiest thoroughfare is taking certain risks which are bound to interfere with the efficiency of the system. On the other hand, if the Town Council desires to keep Princes Street free from wires, and are prepared to adopt the underground system with its disabilities, it would be necessary to consider which of the two systems, viz., the London or the Continental system, to adopt. It is for the Council to decide which of the following schemes should be adopted on Princes Street—

(1) Overhead equipment with side bracket arms, track on the south side of Princes Street. (Type recommended.)
(2) Overhead equipment with side bracket arms, track on the north side of Princes Street.
(3) Overhead equipment with span wires, track in present position.
(4) Conduit system with Brussels type of plough.
(5) Conduit system with London type of plough.

OTHER FORMS OF TRACTION.

Self-Propelled Tramway Cars.

There is no doubt that the ideal form of traction would be self-propelled cars, to be free from wires and rails, but there has not yet been developed a vehicle which meets these conditions and yet retains the advantage of the vehicle running on rails. If (and when) such a vehicle is developed, which can compete, as regards cost of operation and seating capacity, with the present electric car, it will be welcomed by tramway authorities all over the world.

Self-propelled tramway cars have been given a trial on several important systems. The London County Council were anxious to obtain a car that would run without overhead wires, and one of the best makers in the country, Mr. W. A. Stevens, built four petrol-electric tramcars in 1913. These cars were placed on trial, but have been discarded by the Council as not being satisfactory for service in London.

In Hastings, petrol-electric cars were used for seven years, but these have now been dispensed with, and an electric overhead system has been installed in their place.

The Dublin and Blessington Steam Tramways Company purchased two petrol-electric cars in 1915. The cars seat 78 passengers, weigh 19 tons 16 cwts., and would cost at the present time £5,500 each. The cost of operation is 20· to 22· pence per mile, compared with 15·4 pence per mile on the Leith system. The vehicles have given a considerable amount of trouble. On a gradient of 1 in 17, the speed was only 6 miles per hour—the vehicles are not now run on this gradient.

The only system in this country where self-propelled tramway cars are now running is at Morecambe, where four petrol cars are run between Morecambe and Heysham, a distance of 1¼ miles. The cars were made by Messrs. Leyland and Company; they are equipped with engines of 55 H.P., seat 37 passengers and weigh unloaded 8 tons. The steepest gradient they have to contend with is 1 in 15. The vehicles are estimated to cost £2,000 per car at the present time.

There have been several cases where petrol tramcars have been sent to places abroad, chiefly in tropical climates, where coal and electricity have not been available, but, up to the present time, where these cars have been tested, they have proved to be more expensvie to operate than electrically propelled tramcars.

One of the most extensive trials of self-propelled tramcars was that of the Third Avenue Railway, New York, where 50 Edison storage battery cars were in operation. These cars were operated at a loss for several years, and in 1920 the cars were all converted to suit the ordinary overhead trolley system.

Many persons have been looking to Mr. Henry Ford, of America, to develop a self-propelled vehicle to run on rails, but although this has been experimented on for several years, it has not yet emerged as a practical proposition. The Ford Company wrote me in May, 1921, that—"At the present time this project is in its experimental stage only, and far from being a manufacturing proposition."

A self-propelled tramcar equipped with internal combustion engine means that, in the first place, permanent way must be provided; this is the most expensive part of the electric tramway equipment. It also means heavy maintenance on the petrol engine; this is the most expensive part of the motor omnibus. (The cost of petrol on the Corporation omnibuses is 4·5d. per mile, as compared with 2d. per car-mile for electric current on the Leith system.) That is to say, the self-propelled petrol tramcar contains the most expensive elements of both the electric car and omnibus. It has not the advantage which the electric car has in low maintenance costs through the electric motor, and it has not the advantage which the omnibus has in its great mobility. If self-propelled vehicles are to advance, in my opinion, they will not be run on rails, but will run on rubber, namely, as motor omnibuses.

With reference to the development of motor omnibuses as auxiliaries to the tramways, the department has all the facilities for keeping abreast with this development. The Corporation has now the largest municipal motor omnibus system in this country, and it is being operated on a remunerative basis. The usefulness of the motor omnibus service can be increased by supplementing the existing tramways system, rather than by competing with it.

Railless Electric Traction.

Railless traction was introduced over ten years ago, but has not made much progress until lately, when improved types of vehicles have been introduced. Like the motor omnibus, for successful operation it requires roads with smooth paving, and the road upkeep where these vehicles are introduced is rather a serious question. This is a system which can be used with success for extensions to electric tramways where the traffic is light. It has the advantage that it can run into the city on the tramway routes where it is thought necessary to provide through services.

GENERAL.

In considering other forms of traction, it must always be kept in mind that we have already an electric system in Leith, and that the cable assets can best be realised in extending that system; also, that for a city the size of Edinburgh, it is essential to adopt one system which would embrace, at least, all the main routes of the city. For instance, the Council have already decided to remedy the "Filrig muddle," but to have to change vehicles at the Post Office would only transfer this muddle to Princes Street. The future policy should enable routes to be extended wherever possible.

There is no recent development which should have any effect on the Council's declared policy of electrifying the main routes.

SUMMARY OF ESTIMATES.

1st Section.	Including Broughton route (contracts placed)	£172,974
	Grange Road	6,773
2nd Section	... ...	135,486
3rd Section	... ...	302,951
	With overhead equipment on Princes Street	30,527
	Total ...	£648,711

I would ask the Council to give the necessary instructions regarding the electrification of the second and third sections of the system. If this is done, it will lessen the inconvenience which is necessarily caused while two different systems are in operation.

Loss on Leeds City Tramways.—A report on the working of Leeds Tramways Department for the four weeks and five days ended November 2 showed a deficit of £7,005. The following is a summary of the income and expenditure for the period, compared with the corresponding period of last year—

	4 5-7 weeks ended November 2, 1921.	Corresponding period last year.	Increase or Decrease.	
Income	£89,472	£91,640	− £2,178	+ ·811
Expenditure ...	£96,477	£88,490	+ £7,987	+3·617
Deficit	£7,005	+£3,160	−£10,165	+2·806
Do., av. per day	£212	+ £96	+ £308	
Passengers ...	12,189,341	12,471,450	−282,109	
Car-miles run ...	854,528	904,556	− 50,028	
No. of days ...	33	33		

A summary of the aggregate income and expenditure for the 31 weeks ended November 2, 1921, compared with the results for the same period last year, showed a deficit of £44,890, or 1·995d. per mile. The figures for the period as compared with those for the similar period last year are appended—

	Aggregate from April 1, 1921, to Nov. 2, 1921.	Aggregate Corresponding Period Last Year.	Increase or Decrease.	
Income	£581,581	£597,131	− £15,550	+2·200
Expenditure ...	£626,471	£589,770	+ £36,701	+4·486
Deficit	£44,890	+ £7,361	+ £52,251	+2·286
Do., av. per day	£298	+ £34	+ £242	
Passengers ...	77,110,769	83,239,216	−6,128,474	
Car-miles run ...	5,399,875	6,061,133	− 661,258	
No. of days ...	216	216		

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THE INDUSTRIAL NEED OF TO-DAY.

MR. H. E. BLAIN'S APPEAL FOR CO-OPERATION.

Mr. H. E. Blain, C.B.E., assistant managing director of the London Underground Railways, delivered an able and well-reasoned lecture on "The Industrial Revolution in England" at the Caxton Hall, Westminster, on November 23. The meeting was one of a series organised by the Industrial League and Council, of which Mr. Blain is a vice-president. Mr. A. Bellamy, C.B.E. (ex-president of the National Union of Railwaymen), occupied the chair, and pointed out that the Industrial League tried to influence for good the relations between employers and employed, without actually interfering. There had been occasions when he had sat at opposite sides of the table to Mr. Blain, but even when one was out to do one's best for his own side, one came away feeling that in Mr. Blain was a man prepared to consider any just claim, fairly put.

Mr. Blain said to-day we were, nationally, faced with a very serious industrial problem, a problem of the greatest magnitude, and a problem the perspective of which we were probably unable adequately to gauge by reason of our nearness to it. The majority of the "theorists" on this matter had very little to do with either capital or labour—except in theory. Those people who really had to do with capital or labour had very few theories, very many doubts, and the only thing they were really certain about was that they did not know which way industrial relations were going. "We hear day by day," proceeded Mr. Blain, "glib and dangerous talk of revolution; the words 'the coming industrial revolution' seem to be all round us. Sometimes they are almost like a spectre; sometimes used as a threat; sometimes uttered by people almost with fear. Personally, I believe the industrial revolution in England is passed, and that no other type of revolution will be seen in a country and amongst a people pre-eminent in the countries of the world for their hard, practical common sense." (Hear, hear.)

Mr. Blain went on to say that his reason was based primarily on the history of this country, and proceeded to trace the development of England from the days when agriculture was the people's chief occupation, through the dark days of the industrial revolution which marked the advent of machinery. For the misery and hardship inflicted on the working classes in those days he had no justification, but strongly condemned as having left on our industrial system a "blot of infamy which it is almost impossible to eradicate." And to-day, he said, we were suffering, despite the time which has elapsed, from the mental, moral, and physical degradation to which labour was then subjected. It was the happenings of those days which gave rise to the much abused and much misunderstood term "capital." A large part of the odium which rested on, and much of the suspicion which hovered round the employers of to-day was not their fault, but that of the cursed inheritance left by the employers of the industrial revolution. "To-day things industrially are undoubtedly bad," Mr. Blain continued. "They might be worse; they ought indubitably to be better; they *must* be better, or the days of England amongst the nations of the world are rapidly passing away." Oligarchy had gone, democracy held the power, and democracy was on its trial. It could only succeed accordingly as it governed wisely, honestly, and justly. We were now in the stage of industrial evolution, and the need of to-day was for a better understanding between employers and employed. In a concluding appeal for the Industrial League, Mr. Blain said its one object was to bring together all of us of the common blood, because the League believed that only by co-operation and genuine good feeling could England be placed again at the head of the great nations of the world. (Applause)

An animated discussion followed, and both the speaker and chairman were cordially thanked for their services.

"The Tramways and Light Railways Association Journal" for November records a further reduction of 2s. per week (making a total reduction of 5s. per week) in the wages of tramway employees, which came into operation at the beginning of this month; the raising of the "adult age" of railway workers from 18 to 20, and the fresh scale of wages of new employees under the age of 20; the recent withdrawal of the engineers' bonus; and the terms of a further settlement, arrived at on November 4, in regard to wages by the National Joint Industrial Council for the electricity supply industry. This agreement provides for the adoption of a sliding scale in accordance with the official index figure of the cost of living. The datum figure chosen is 120 per cent. above that of July 1914, and it is stated that the next wages revision would take place as from the 15th of the present month, with a revision each succeeding three months. The method of variation is to be an increase or decrease, respectively, of one halfpenny per hour for every completed six points of fluctuation in the cost of living figures. An explanatory memorandum is published of the regulations relating to guard wires on electric tramways and light railways laid on public roads.

URBAN ELECTRIC RAILWAY SERVICES.

LECTURE BY MR. J. P. THOMAS.

A lecture on "The Operation and Development of Urban Electric Railway Services" was given by Mr. J. P. Thomas, operating manager of the London Underground Railways, before graduates and students of the Institute of Transport on November 18, at the Royal Society of Arts. Sir H. P. Maybury presided.

Mr. Thomas said among the subjects which called for careful study was the influence on speed of station stops. On the Underground Company's system 80,000 station stops were made daily, and the electric energy absorbed in the normal starting of trains was more than one-third of the total day's output of the generating station. The interval between stations on any new lines should be widened, and the diffusion of traffic between stations provided for by surface transit. Consideration should also be given to the plan of equipping the stations with four tracks, two in each direction, to allow of trains unloading and loading whilst the following trains ran into the adjacent platforms. After emphasising the important advantages of the proposed extensions to the Underground Railways, Mr. Thomas said the development of the urban electric services was further possible by the projection of deep level underground lines on to the main line suburban tracks. Striking as the progress in transport had been, the rate of diffusion of population could not be regarded as satisfactory. Considerable development had yet to take place in the transit facilities of the south-eastern areas of London. The electric railways in the north of London were becoming congested, and new direct railways from the north-west to the south-east and the north-east to south-west through Central London, pivoting on Piccadilly Circus, were a necessity.

FIFTY YEARS' TRAMWAY SERVICE.

NOTABLE RECORD OF EDINBURGH CASHIER.

What is probably a unique record of service is that of Mr. John Willis, cashier in the Edinburgh Corporation Tramways department, who has completed 50 years of continuous work in the tramway industry—practically all under the same management. It is believed that Mr. Willis is probably not only the oldest employee in the industry in respect of actual age, but that he is the oldest as regards service. His colleagues at Edinburgh, among whom he is held in warm regard, have decided to present him with an illuminated address and a purse of Treasury Notes. As is shown by his record, which we append, Mr. Willis has served under, or come in contact with, men whose names are prominently identified with the development of tramways. His history, in fact, practically coincides with that of the Edinburgh tramway undertaking.

In 1871 he entered the service of the Edinburgh Street Tramways Company under Mr. Archibald Grierson, C.A., treasurer and registrar, and later under Dr. Alexander Wood, chairman of directors and general manager. Mr. Willis was appointed cashier in 1882, and it was in 1884 that the late Sir J. Clifton Robinson was appointed general manager, in succession to Dr. Wood. In 1886 Sir J. Clifton Robinson removed to London, and was succeeded by the late Mr. John E. Pitcairn as general manager. In 1893 the tramways in the City of Edinburgh were purchased by the Corporation, and thereafter leased to Messrs. Dick, Kerr and Company, of London. In 1894 the Edinburgh Street Tramways Company—now left only with that portion of the tramways in the Burgh of Leith to manage—appointed Mr. James Adam as manager and secretary, Mr. Willis still carrying out the duties of cashier. Leith Tramways were purchased by the Burgh of Leith in 1904, and the office was removed to Leith. Mr. Willis was then appointed cashier under the management of Mr. John Wilson, who in 1908 was succeeded by Mr. A. F. Fitzpayne. The lease of the tramways in Edinburgh having expired in 1919, the Corporation of Edinburgh took over the management, and appointed Mr. R. Stuart Pilcher as tramways manager. With the amalgamation of Edinburgh and Leith in 1920, the tramways of Leith were, of course, absorbed by Edinburgh Corporation, and operated as part of the Edinburgh undertaking. The Leith staff was transferred to Edinburgh where Mr. Willis still carries out his duties.

During the whole of this period Mr. Willis took a leading part in different organisations formed for the welfare of the employees, and acted as honorary treasurer of sick and benefit societies, holiday funds, etc. The presentation is being organised by a committee, of whom Mr. Robert Wilson is secretary. We are asked to state that those who wish to subscribe may do so to the treasurer of the fund, Mr. Aitken, through Mr. Wilson.

Municipal Transport Organisation.—Newport Corporation have appointed a Transport Committee to be in charge of all motor vehicles, and this committee have now decided to purchase two service recorders at about £10 each, one to be attached to a general haulage lorry and the other to a scavenging vehicle; and to pay the foreman in charge of the motors £5 5s. a week.

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REDUCTION OF LONDON FARES.

PENNY MINIMUM ON TRAMCARS AND OMNIBUSES.

The penny minimum fare was restored on December 1 on the London County Council Tramways, the omnibuses of the London General Omnibus Company, and those tramway undertakings which, like the L.G.O.C., form part of the Underground group. These tramway companies include the London United Tramways, Metropolitan Electric Tramways, and South Metropolitan Electric Tramways and Lighting Company. On the County Council Tramways the 1½d. fare is abolished, and the distances given for 2d. and 3d. are lengthened. Similar concessions also apply on the vehicles of the L.G.O.C. in the area covered by the County Council Tramways, though the penny fare on the omnibuses is in operation throughout the whole of London, except on certain outlying country routes.

The proposals for the revision of the London County Council tramway fares were submitted by the Highways Committee to a meeting of the parent body on November 15. The committee stated that they viewed with concern the serious diminution of traffic on the Council's tramways which had been apparent for some time past. They presented figures which showed a decrease both in the number of passengers and the amount of traffic receipts in the case of the 1d., 1½d., and 2d. fares, although there had been an increase of passengers and revenue in the case of all other fares, a condition which appeared to indicate that the loss of passengers was due to people walking short distances instead of using the cars. With a view to regaining the lost traffic, the general manager had suggested that the lower fare stages should be lengthened. The average distance now given for 1d., the report proceeded, is about 0·6 of a mile (one section). As it is impracticable to sub-divide fare stages, it will be necessary, if this course is adopted, to lengthen the present 1d. stage of one section to two sections (a distance of about 1·2 miles), which is equivalent to reducing the 1½d. fare stage to 1d. This, however, is not a step which could be taken by itself, as only three sections are now given for 2d. It would therefore be necessary to give at least four sections (about 2·4 miles) for 2d. if two sections were given for 1d. Similarly, only five sections are now given for 3d., and it would be necessary to give at least six sections (about 3·6 miles) for 3d. if two were given for 1d. In the case of the higher rated fares this difficulty would not arise, as eight sections are already given for 4d., 12 for 5d., and a maximum of 6d. is charged for more than 12 sections. As regarded children, the principle now in force would apply, viz., 1d. for an ordinary 2d. stage; 2d. for an ordinary 3d. or 4d. stage; and 3d. for a 5d. or 6d. stage. The recommendations of the committee were confirmed.

At a meeting of the Council on November 22, Mr. Squires said at present it was not proposed to reintroduce ½d. fares for children, but the distance over which children could travel for 1d. would be increased to 2½ miles.

OMNIBUS COMPANY'S DECISION.

The London General Omnibus Company announced, shortly after the London County Council's decision, the reintroduction of the penny minimum fare throughout the London area on both the omnibuses and those tramway undertakings also associated with the Underground group. In their announcement the L.G.O.C. referred to the decision of the County Council to "introduce extensive reductions in their fares," on December 1, and added that the Underground companies, railway and omnibus, were vitally affected by the action of the London County Council. Even with the (then) existing fares the revenues had fallen short of the amount necessary for a reasonable return on capital after payment of working expenses and setting aside a proper sum for depreciation. Therefore they were compelled, the statement proceeded, to adopt the London County Council proposals in the area covered by the Council's tramways. Up to 4d. the fares on omnibus or tramcar would be identical. The company could not afford to introduce similar proposals throughout the whole of London.

Referring to the reinstatement of the penny fare throughout London, as stated above, the announcement added that outside the London County Council tramways area this penny fare would be good for a single stage or for a little over half a mile, being the distance from one fare's point to the next (except on a few outlying country routes where traffic is sparse and an initial fare of 2d. is already in force).

The new fares would take effect on December 1, and on January 1 it is intended to introduce children's tickets at approximately half-price on the omnibuses for children up to 14 years of age. It is not intended to make any corresponding alterations in the Underground railway fares. This is in accordance with the declared policy of the Underground that short-distance passengers should be encouraged to use the surface means of transport, and that the railways should be left free to carry more comfortably those who have to travel longer distances.

L.C.C. TRAMWAY DEVELOPMENTS.

NEW ROUTE AND TROLLEY OMNIBUS SCHEME.

At a meeting of London County Council on November 15, an important scheme for the extension of the Council's tramways and the inauguration of a railless trolley omnibus service was considered. The Council decided to seek powers in respect of one of the two proposed new tramway routes and of the trolley-omnibus project.

In accordance with the resolution of the Council of November 1, the Highways Committee reported that, together with the Parliamentary Committee and the Special Committee on Unemployment, they had considered what scheme of linking up and extending of the tramways could be profitably undertaken, provided the necessary Parliamentary powers could be obtained. In July 1921, the Council decided that in the present circumstances they would not be justified in promoting a Bill in the session of Parliament of 1922 for the construction of new tramways, but the Highways Committee had decided in the light of the altered circumstances and with the object of relieving unemployment, to recommend the Council to seek powers in respect of the following schemes—

(1) Seven Sisters Road to Stamford Hill via Amhurst Park, 4 furlongs 6 chains of double line to be constructed on the overhead system, and 6 chains of double line on the conduit system. Estimated cost of construction and equipment, £74,715.

(2) Forest Hill to Bell Green via Westbourne Road, Perry Vale and Perry Rise. About 9 chains of double line on the conduit system, and 1 furlong 2 chains of single line on the overhead system. Estimated cost, £92,831.

(3) West Norwood, via Norwood, Crystal Palace, Sydenham, and Catford to Lee Green. Trolley omnibus system, 8 miles. Estimated cost, £148,670. This line would form an important cross-town connection, and in conjunction with existing tramway routes, would give facilities to areas at present inadequately provided for. The line would also serve two large housing estates, viz., Bellingham and Grove Park.

In addition to the figures given for construction and equipment, including cars and trolley omnibuses, it is estimated that in the case of the Forest Hill line road widenings would be required, which are estimated to cost £28,700, and the total capital expenditure involved for the tramways and widenings is £344,916.

The Parliamentary Committee reported that in order to comply with the standing orders of Parliament, the notice of the Bill must be published in a newspaper on November 19, the plans and books of reference must be deposited on November 30, and the necessary notices must be served by December 15. Although the time is short, it is anticipated that it will be possible to complete the work within the time prescribed. The consent of the road authorities, as required under standing order No. 22, has, however, not yet been obtained, and unless this can be done it will be necessary to secure the suspension of the standing order before the Bill could proceed. The schemes will be put forward as a matter of urgency on the ground that they will provide additional employment, and this might be regarded as a reason for exceptional treatment. The consent of the road authorities is not necessary under the standing order to the scheme for the provision of trolley vehicles.

An amendment by Mr. J. M. Gatti, chairman of the Finance Committee, to omit the Forest Hill and Bell Green extension was carried by a majority of one—50 to 49. The other extension was agreed to, as well as the trolley omnibus scheme.

TRAMWAY AND TROLLEY OMNIBUS RETURNS.

NEW COMMITTEE FORMED.

The Minister of Transport has appointed a committee to consider the question of the return relating to tramways and trackless trolley undertakings, which it has been customary to present annually to Parliament. The committee is to consider—

(i.) What, if any, alterations are desirable in the form of return relating to tramways and trackless trolley undertakings, which it has been customary to present annually to Parliament; and

(ii.) To suggest such instructions as may be necessary to ensure that the accounts and statistics furnished for the purposes of that return are compiled on a uniform basis.

The members of the committee are as follows—

A. E. Kirkus, O.B.E., chairman, Ministry of Transport.
W. Bateson, borough treasurer, Blackpool.
J. Beckett, general secretary, Municipal Tramways Association.
A. W. A. Chivers, British Electric Traction Company
J. Dalrymple, general manager, Glasgow Corporation Tramways.
A. R Fearnley, general manager, Sheffield Corporation Tramways.
N. M. Griffiths, O.B.E., Ministry of Health.
R. H. Hill, Ministry of Transport.
C. J. Spencer, general manager, Metropolitan Electric Tramways, etc.
C. D Stanley, A.M.I.E.E., Ministry of Transport.
W. G. Verdon Smith, managing director, Bristol Tramways.
T. W. Maughan, Ministry of Transport, secretary to the committee.

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PUBLIC WORKS, ROADS AND TRANSPORT.

EXHIBITION AT THE AGRICULTURAL HALL.

Of the many and varied appliances required for municipal work, road construction and transport there are few which did not find a place in the exhibition held at the Agricultural Hall, Islington, London, from November 17 to 25. Like other exhibitions on somewhat similar lines which have been held within the last couple of months, it served to demonstrate the high level of efficiency achieved by the manufacturers of such vehicles as road sweepers, cleansers, tipping-wagons and mixers; the state of perfection to which road motor transport generally has been brought, and—what is equally important—the great strides made in road construction. At a congress held in conjunction with the exhibition, papers were read bearing upon these and allied subjects, while in the cinematograph hall, exhibitors' films depicted their respective machines at work or their specialised processes in course of execution. We give below a short description of some of the more noteworthy exhibits. Some notes on motor vehicle exhibits will be found in Motor Section.

Millars' Timber and Trading Company, Limited, of Pinners' Hall, E.C., had a very large and attractive stand on which were shown a wide range of labour-saving equipment. This included the Osgood model 18 revolving steam shovel, especially adapted for the lighter class of excavating work; the Cummer portable petrol-driven dryer, a self-contained machine for the preparation of stone and sand for asphalt roads; a Ransome 10E steam concrete paver, in which steam power completely produces and distributes the concrete, and the familiar Springfield tandem steam roller. There was also an extensive range of concrete mixers; a path-digging wagon loader; a smaller "Mascot" loader; the Tructractor which has now been so largely adopted; rock crusher; portable petrol-driven air compressors for use in connection with light pneumatic tools; derricks; pneumatic painting equipment; petrol-driven pumps; Akron barrows; hoists and semi-Diesel engines.

Three combined stands were necessary to house some of the representative products of Hadfields, Limited, of Sheffield. At one end was an array of "Hadura" tramway points, made of patent "Era" manganese steel, accompanied by car wheels and axles, separate tyres, fishplates, and tie-bars. A novel feature of the stand was the model of Fitzalan Square junction of Sheffield Corporation Tramways, the rails for which were laid by Messrs. Hadfields. It was pointed out as a testimony to the durability of the firm's patent steel, that the original layout lasted for 11 years, before it was replaced by another from the same works. At the opposite end of the stand were types of machinery in motion, including a combined mounted stone-breaker and screen, in the manufacture of which the firm have applied to advantage their vast knowledge of the wearing qualities of steel. There was also working a "Hecla" disc crusher (Symon's patent), which specialises in the production of top dressing. Also to be seen were some scarifier picks, for operation through the medium of road rollers, and such sundry items as barrow wheels, tar-boiler wheels, shovels, forks, etc.

The largely-used B.R.C. method of road making was adequately explained and illustrated at the stand of the British Reinforced Concrete Engineering Company, Limited, of 1, Dickinson Street, Manchester, and Caxton Street, S.W.1. We understand that over 1,000 roads have now been built up by this process. A typical cross-section of part of a road was shown, and the company, it was explained, now undertake the construction of concrete roads with surfaces of either wood blocks, macadam, tarmac or sets, in addition to complete concrete thoroughfares. Their work in connection with tramway foundations is too well known to need more particular reference. The walls of the stand were embellished with an excellent array of large photographs of work done and in progress.

Stewart and Lloyds, Limited, of Winchester House, Old Broad Street, E.C.2, had on view many types of their noted welded mild steel pipes, joints, and fittings. Their steel tubular tramway poles, with fittings, and also their handrails and tubular supports were also represented. John Yates and Company, Limited, of 70-71, Scholefield Street, Birmingham, whose name is familiar as suppliers of every kind of tool, plant, and stores for municipal and contractors' work, had a stand containing an excellent collection of samples. Rail carriages, jim crows, rail jacks, platelayers' spanners, barrows and spades were among the host of appliances we noted.

George Pike, of Richard Street Forge, Birmingham, exhibited a large section of tools and appliances, including several for tramway track work, such as rail carriers, jacks, tongs, cutters, gauges, levers, point tongue movers, and drilling cramps. Buckley, Saunders and Company displayed many specimens of welded work on the stand of G. Percy Trentham, Limited. Among the samples to be seen were lap and butt welds and angle welds, while testimony to the durability of the work was afforded by sections through specimens, and welded metal subjected to tests. Demonstrations of rail welding and building-up attracted much attention.

MANCHESTER TO LIVERPOOL ROAD.

PROPOSED EXPRESS TRAMWAY.

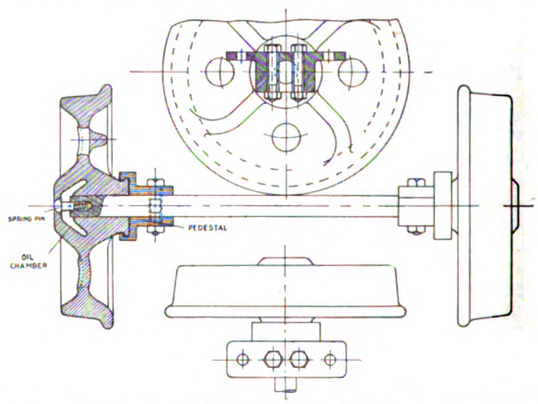
Much interest has been aroused in the cities and towns of South Lancashire by the proposal for a new trunk road from Manchester to Liverpool. The scheme, which has been under consideration for several months, arose mainly through the need for finding work for the unemployed. It was originally suggested in a letter from the Town Clerk of Salford (Mr. L. C. Evans) to Sir Montague Barlow, M.P., following an interview which Sir Montague had with the ex-Mayor of Salford (Alderman Hampson). The letter advocated co-operation between county and civic authorities in providing work, and stated, as an example of what could be done in South Lancashire, that it would be possible to make a main road 120 feet wide between Manchester and Liverpool parallel with the original Liverpool and Manchester Railway. This line runs practically straight, over Chat Moss and the open country, though the existing main road from Manchester to Liverpool only follows the railway through Salford and Eccles and then diverges, to take an indirect route through Warrington, Prescot, and other busy districts. The letter further suggested that Sir Henry Maybury (Director-General of Roads, Ministry of Transport) and the engineers of the Lancashire County Council, the cities of Manchester and Liverpool, and the county borough of Salford, should meet to consider the schemes.

A plan prepared by the Salford borough engineer (Lieut.-Colonel E. B. Martin) showed that the new road would pass chiefly through agricultural land, avoiding most towns and villages. He favoured the construction of a double tramway track, railed off, to provide a service of express cars, with specified stopping-places. The track could, of course, be used for the conveyance of road material during the constructional period. It is understood that a preliminary survey of the ground was made by one of Sir Henry Maybury's staff, and that an informal interview on the matter has taken place between the city engineers of Liverpool and Manchester and the Town Clerk and borough engineer of Salford.

Commercial motor traffic in South Lancashire is particularly heavy, in the double sense of the word, and several important industrial towns would benefit by such a road for fast traffic between the two big cities. The road itself would have to be of especially durable construction, probably with either concrete foundations or wholly of concrete. The cost has been roughly estimated at between three and four million pounds, and it is understood that the Ministry of Transport regard the scheme as a practicable one.

"BOULTON" SELF-OILING WHEELS.

What is claimed to be an appreciable advance on any previous type of self-oiling wheel has been patented by the British Griffin Chilled Iron and Steel Company, Limited, of Temple House, Tallis Street, London, E.C., and Barrow-in-Furness. The "Boulton" wheels, as will be seen from our illustration, run loose on a fixed axle, and are intended principally for use in quarries, mines, and collieries. When the wheels are originally installed it is necessary to obtain the special accompanying pedestals, but these outlast



Boulton Patent Self-Oiling Wheel fitted with Spring Pin.

several sets of wheels. In order that the wheels may be charged with oil, spring pins are usually fitted and can be promptly renewed. Caps or studs can be substituted, however, if preferred. Once supplied with oil, the wheels operate for a long period without further attention. Their re-charge with lubricant, when necessary, is easily accomplished. Perfect lubrication, a considerable economy in haulage power and in oil, are the primary advantages claimed by the patentees. The wheels are very suitable for sharp curves.

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LONDON FOG.

How the Traffic was Affected.

Londoners are not exactly proud of the dense fogs which occasionally descend on the metropolis, but though these visitations seriously retard the comings and goings of the people, they regard them with a kind of indulgent interest as being of a brand peculiar to London. Not so with the driver of the tramcar, omnibus, and other motor vehicles. A fog such as London experienced during four or five days at the end of November means a very trying and anxious time for the driver, especially of a vehicle loaded with passengers. To anyone who has not seen a real London fog, the appearance—or rather the disappearance—of the streets is hardly conceivable. The number of yards distance ahead which it is only possible to see can frequently be counted on the fingers of one hand.

During the week-end of November 26 and 27, the density of the fog which visited London literally disorganised traffic and reduced the otherwise busy thoroughfares to a state bordering on chaos. Tramcars had almost to "crawl along," and in order to avoid collision with any stray vehicle, the motorman was forced to peer fixedly ahead and to sound his gong every few seconds. The omnibus driver was perhaps in a worse plight, on account of the necessity not only to control his forward motion, but to steer and to avoid collision with the kerb or roadway refuges. So bad did conditions become that acetylene flares were lit at some of the principal crossings to guide vehicular and pedestrian traffic. On the Saturday and Sunday evenings mentioned omnibus services were gradually prevented from continuing to run, owing to the extreme slowness of progress and the risk involved. Many were lined up in the suburbs unable to set out. In the low-lying districts adjoining the Thames near Woolwich the fog was particularly opaque, and omnibuses which here pass mainly through country roads on the Woolwich, Erith, and Crayford services were equipped with extra lamps casting rays sideways and downwards to enable the drivers to see the near kerb. At 5 p.m. a procession of nine omnibuses, headed by a man walking with a lamp, passed through Beresford Square. The tramcars generally continued to grope their way through the murk, and thus somewhat relieved the pressure. On some routes the "rush hour" trailers had to be taken off. One or two minor collisions occurred, but the great caution practised by drivers as a whole was exemplified by the comparatively small number of mishaps. Trains on the lines running into London were delayed, though passengers from the south coast reported brilliant sunshine there. The tube railways were unaffected, though some fog crept into the exposed portions of the District Railway and the open sections of the Metropolitan Railway.

"FREE" OMNIBUS RIDES.

Services Not Permitted on Tramway Routes.

At Indianapolis (U.S.A.) the City Council have passed an ordinance that omnibuses shall not ply for hire on street car routes. The result was that the omnibuses carried the sign "Free" when passing through streets used by the cars. The drivers, however, accepted contributions offered by passengers. The *Commercial Vehicle* (New York) says, "The law apparently does not cover this, and it is also rumoured that one who fails to make a contribution is not 'seen' by some of the drivers the next time one waits to be picked up."

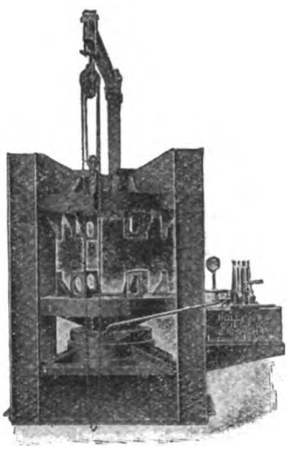
At Columbus the City Council have imposed a payment of one cent per mile per omnibus as a franchise fee, intended to cover the cost of street wear. In addition, each company must deposit a surety bond of 25,000 dollars or carry liability insurance to the amount of 5,000 dollars for the injury of a single person, or 25,000 dollars for several persons, and 5,000 dollars for damage to property. The Council reserves the right to regulate routes and fares. No omnibus line is to be operated on a street supplied with street car lines. The omnibus must not be more than 86 in. wide, must be properly lighted and heated when the temperature falls below 35 deg.

Southampton Corporation Omnibus Services.—In his report for the year ended March 31 last, the general manager and engineer of Southampton Corporation Tramways (Mr. James Dobson), states that there was a net deficiency of £9,688 on the year's working. This has been met by the transference of £6,688 from the depreciation and renewals fund and £3,000 from the Third Party Insurance Fund. The traffic receipts on the omnibus section amounted to £12,344, an increase of £6,837; the passengers numbered 1,341,913, an increase of 696,571, and the mileage was 176,868, an advance of 85,439. The total receipts for the omnibuses averaged 16·85d. per mile run.

SOLID TYRE PRESSES.

In a motor repair shop, where the removal and replacement of solid rubber tyres on commercial vehicles occasionally forms part of the routine, the advantages of a tyre-press which permits of this operation without removing the wheels from their axle will be apparent. Such a machine figures in the new list (No. A 101) of hydraulic and screw presses manufactured by Hollings and Guest, Limited, of Thimble Mill Lane, Birmingham.

The type of hydraulic press here illustrated corresponds to the firm's well-known standard No. 13 and No. 14, but has a special form of head with an open slot, which, as stated, makes possible the fixing or removal of tyres without detaching the wheels from their axles. This convenience is particularly valuable in the case of, say, a motor omnibus or other commercial vehicle which can ill be spared from service. There are two such types of press, the No. 13 S. and the No. 14 S. Their respective specifications are as follow—No. 13 S—Size of ram, 14 in. diameter; total pressure, 154 tons; approximate net weight, 4 tons 15 cwt.; approximate gross weight, 4 tons 17 cwt.; measurement, 280 c. ft.; Type No. 14 S.: size of ram, 16 in.; total pressure, 200 tons; approximate net weight, 6 tons 16 cwt.; approximate gross weight, 6 tons 18 cwt.; measurement, 310 c. ft. There is also a special 200 tons press, having a 40 in. stroke, which is supplied in three different series with net weights ranging from 7 tons 2 cwt. to 8 tons 1 cwt. The presses themselves have a framework of rolled steel, riveted together, and a cylinder of cast iron. The rams are also of cast iron, and the stroke of the 13 S. and 14 S. types is 18 in. The table and head have a diameter of 4 ft., are 2 ft. 6 in. apart, and are machined true together. To admit the wheel boss, the table has a 12-in. hole in the centre, while the head has an open slot to admit the wheel axle. The pumps are of the double ram type on tank. There is a large ram for raising the press quickly and a smaller one for giving high pressure. A pressure gauge shows the total pressure on the table at any time. A runway with one-ton blocks is supplied, if desired.



Hollings and Guest 14 S. Tyre Press.

Messrs. Hollings and Guest have also in stock a new 50-ton press for use in small garages. This is stated to be a very economical piece of plant. Their catalogue further illustrates one of the latest designs of hydraulic pump driven by chain gearing from an electric motor. Other types are also specified, complete with the necessary valves, fittings, and connecting pipe to press. The firm's list, No. A 111, gives the foundation drawings and directions for the erection of the presses. It is pointed out that Messrs. Hollings and Guest have all their standard sizes of tyre presses (prices for which are quoted) in stock for immediate delivery.

APPLICATION FOR ROADS ACT ORDER.

The Ministry of Transport a short time ago held an inquiry at Southport into the application of the Corporation for an order under the Roads Act, 1920, to limit the speed of heavy motor vehicles over certain roads to eight miles an hour.

According to a statement made by the town clerk, the main reason of the application arose out of the peculiar local conditions, namely, the sandy subsoil on which the town was built. This gave rise to vibration. A medical witness stated that patients complained of the disturbance from heavy motor traffic. When coaches flashed by he had to stop examining his patients, and he advised them to live in back rooms. Another doctor stated that serious injury was done to children's health by the vibration of coaches travelling at night. It was "a perfect misery to live on the routes."

Mr. Dean, who appeared for motoring interests, contended that a reduction of speed could not be granted on the ground of damage to property, and that a reduction of speed would have little effect on vibration. To schedule certain routes would result in traffic being diverted to other roads without removing the difficulty.

The inspector visited some of the houses where damage was stated to have been caused, and he also attended a speed test of a coach on one of the worst portions of a road.

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FINANCIAL REPORTS AND MEETINGS.

SIEMENS BROTHERS LIMITED have announced an interim dividend of 1s. per share.

AUCKLAND ELECTRIC TRAMWAYS have declared a dividend of 5¼ per cent., free of tax.

DAVID BROWN AND SONS (HUDDERSFIELD), LIMITED, have declared a dividend of 10 per cent.

INDIAN ELECTRIC SUPPLY AND TRACTION COMPANY have announced an interim dividend of 3 per cent. on the ordinary shares.

THE CHLORIDE ELECTRICAL STORAGE COMPANY, LIMITED, have announced a dividend of 5 per cent. actual on the ordinary shares (tax free).

ISLE OF THANET ELECTRIC TRAMWAYS AND LIGHTING COMPANY, LIMITED, have declared a dividend of 2½ per cent., less tax on preference shares for the half year to July, 1908.

THE BRITISH ELECTRIC TRACTION COMPANY have announced an interim dividend of 3 per cent. on the 6 per cent. cumulative participating preference stock on account of the current year.

UNITED ELECTRIC TRAMWAYS COMPANY OF CARACAS.—A dividend of 8 per cent., less tax, is recommended, carrying forward £14,852, subject to E.P.D. and Corporation tax. The net revenue was £20,585, including £7,867 brought in.

ELECTRIC CONSTRUCTION COMPANY.—Interim dividends are announced at the rate of 7 per cent. per annum on the preference shares and 6 per cent. per annum on the ordinary shares, both less tax, for the year ending in March next.

CHILEAN TRAMWAYS.—An amalgamation has been effected between the Chilean Electric Tramways and Light Company and the National Electric Power Company. The combined capital, the bulk of which is English, is £12,000,000 sterling.

JOHN BROWN AND COMPANY, LIMITED, have announced an interim dividend on fully paid ordinary shares of 6d., and on part-paid ordinary of 4½d., being at the rate of 2½ per cent. Last year the interim dividends were respectively 10d. and 7½d.

WALSALL'S IMPROVED POSITION.—Whereas during the first three months of the year a loss of about £3,000 was incurred on Walsall Corporation Tramways and omnibus undertaking, during the three months ended September 30 there was a net profit of £36.

DENNIS BROTHERS, LIMITED, have declared a dividend at the rate of 13 per cent. Their return for the previous three years was 20 per cent., and to have been able to pay so high a rate as 13 per cent. in face of the difficulties of the past year is an excellent performance, on which the company may be congratulated.

THE BRITISH THOMSON-HOUSTON COMPANY.—The subscription list of the new issue of 7 per cent. mortgage debenture stock of this company, issued at 92½, was closed on November 23. The amount of the issue is £1,500,000, which forms part of a total of £3,000,000, and will be repayable on May 1, 1962, by the operation of a sinking fund beginning next year.

GREENOCK AND PORT-GLASGOW TRAMWAYS COMPANY.—The annual report shows that the total receipts for the year 1920 were £84,518. After providing for all expenses chargeable to revenue, and setting aside £6,000 for renewals, there was a surplus of £3,937, making, with £216 brought forward, a total of £4,154. This, the directors propose, should be apportioned as follows—To sinking fund for loan redemption, £1,743; to reserve, £2,000; leaving a balance to be carried forward of £410. The directors regret that the result of the year's working did not admit of payment of any dividend.

AYR CORPORATION TRAMWAYS.—The total revenue for the year ended May 15, 1921, amounted to £39,390, and the working expenses to £34,364. Including bank interest (£275) there was a gross profit of £5,300, as compared with £7,040 in the previous year. After payment of interest on loans, contributions to sinking fund, and carrying £4,243 to the depreciation and renewals fund, there was a deficit of £4,272 against a deficit of £3,227 in the previous year. The deficit is ascribed by the manager, Mr. W. Grant, to a further advance in wages and reduction in hours. An interesting comparison is given of the wages paid during 1914 with those prevailing in December 1920, from which it appears that the weekly wages, which aggregated £100 in 1914, had increased to £265 in 1920. The average earnings for an employee working full time had increased from £1 4s. 6d. per week to £3 8s. The proportion of wages to revenue thus increased from 28 per cent. to 46 per cent. The receipts per car-mile were 20·16d., as against 18·27d. last year. The total working expenses amounted to 18·10d., the ratio of expenses to receipts being 87 per cent. The consumption of energy per car-mile was 1·15 units, the cost per unit being 2·99d. The number of passengers carried was 5,647,111, an increase of 157,279. Mr. Grant mentions that all cars have been fitted with a new type of boxes for used tickets. These boxes are larger, and their use has reduced the number of tickets that have been strewn about the cars and roadways.

WELLINGTON (N.Z.) CORPORATION TRAMWAYS.—Revenue for the year ended March 31, 1921, amounted to £347,695 (increase £70,608), working expenses £289,320 (increase £79,890), capital charges £51,892 (increase £6,060), credit balance £6,483 (decrease £15,342). Ten cars were constructed at the Newtown workshops, increasing the total to 131, and orders were placed during the year for material and equipment for another twelve cars. The department had in stock seventeen petrol motor vehicles, comprising three tower wagons, six lorries, two freight vans, three run-abouts, one omnibus, one arc welder car, and an emergency van for dealing with rolling stock breakdowns. The number of passengers carried aggregated 37,296,414, an average of 414 journeys per head of population of 90,000 in the city and suburbs. Owing to the increased cost of operation and material, and particularly of coal, which in the case of some over-seas shipments reached £4 per ton, it was found necessary to increase the fares on May 31, 1920, and again on December 23. Owing to the amalgamation of the Karori and Miramar boroughs with the city, their tramways, aggregating a track length of 6½ miles, were incorporated with the Wellington City Tramways. The total number of officers and men engaged in the tramway service on March 31, 1921, was 717. The committee during the year in question consisted of Messrs. J. P. Luke, C.M.G., M.P. (chairman), W. J. Gaudin, T. Forsyth, P. Fraser, M.P., J. Henderson, C. J. B. Norwood, W. J. Thompson, and R. A. Wright, M.P.

WALTHAMSTOW COUNCIL TRAMWAYS.—In his annual report for the year ended March 31, 1921, the manager of the Walthamstow Council Tramways (Mr. William Murray) remarks that the financial position is one which invites, and indeed calls for, the careful scrutiny and searching criticism of the committee. The position is that while the traffic revenue has increased by £15,000, the working expenses increased by over £36,000, so that the undertaking is faced with an adverse balance of nearly £32,000. There is in reserve approximately £18,000, leaving a sum of £14,000 to be provided from the rates. The wages bill for the traffic staff increased by about £12,000, due to increases in pay and extra holidays granted to the employees under the national agreements. There was also an increase in the number of cars. The average expenses, including interest and repayment of loans, amounted to 25·39d. per car-mile, the total revenue averaging 10·6d., or a loss of 5·75d. per car-mile. Mr. Murray sees little hope of large decreases either in wages or in the cost of material, and considers that some means ought at once to be adopted of materially increasing the revenue. The total number of passengers carried was 18,620,000, a decrease of 331,413. The average number of passengers per car-mile was 14·26 (against 15·12), while the car-miles run were 1,305,685, an increase of 41,458. The number of workmen carried increased by 1,086,451. Mr. Murray says all their experience thus far shows that unfair competition alone is the great handicap which has for the time being, at least, placed the undertaking in the unfortunate position of being unable to meet its financial liabilities. Power consumption was at the rate of 1·47 units per car-mile, an increase of 0·4 units, which is probably the lowest in the Metropolitan area. The charges for energy have been increased to 2·58d.

ILFORD URBAN DISTRICT COUNCIL TRAMWAYS.—In his report for the year ended March 31, 1921, Mr. L. E. Harvey, manager of the Ilford Council Tramways, mentions that the remaining fifteen centre poles from Seven Kings Station to Seven Kings Hotel were removed and span wire construction was substituted. The work was particularly difficult owing to the great width of the roadway in front of the station, and there is probably no other instance of any tramway where such long span wires have been successfully used. During the year two miles of 3/0 trolley wire and 31 new poles were erected. The total revenue amounted to £70,050 (an increase of £6,803 on the previous year). The working expenses were £48,829, cost of current £11,396, Barking track lease £1,646, making a total of £61,871 (an increase of £6,952), leaving a gross balance, including £557 for instalment and interest for electricity department machinery, of £8,736. Interest on capital and contribution to sinking fund required £9,235, leaving a deficit of £499, which compares with a profit of £3,494 in the previous year. Owing to a strike of the municipal electricity employees no current was available for traction from January 14 to 19, and this entailed a cost of £1,200 on the undertaking owing to the loss in receipts. The deficit is explained mainly by the maximum bonus of 40s. which was paid to all employees for practically the whole of the year. The total wages paid were £33,630, an increase of £5,105 over the previous year, and represented 54·7 per cent. of the total expenses and 48 per cent. of the total revenue. In 1914 the wages paid amounted to £11,132. The delivery of sixteen new cars ordered in July 1920 was completed during the year, the cost of each of the last ten being £2,225 10s. 10d. The following figures are taken from the report—Miles run 794,620 (an increase of 4,338), passengers carried 10,431,277 (a decrease of 42,480), receipts per car-mile 20·499d. (an increase of 1·73d.), average fare per passenger 1·50ed., working expenses per passenger 1·415d.

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TRAMWAY AND LIGHT RAILWAY NOTES.

ABERDEEN.

COUNCILLOR BEATON ON TRAMWAY PROBLEMS.

Councillor D. W. Beaton, convener of the Corporation Tramways Committee, addressing a luncheon meeting of the city's Rotary Club on November 17, said that as an advocate of municipal ownership he also advocated that schemes of public service ought to be run without having recourse to rate aid. Councillor Beaton remarked that he was pleased Aberdeen Corporation Tramways was one of the five municipal systems which paid their way last year. He sometimes wondered if the fact that all these tramways had recourse to the rates led them into what one might call extravagant schemes. Referring to motor omnibuses, Councillor Beaton said great care must be taken in putting on services that they did not divert traffic from the existing tramway system.

BIRMINGHAM.

NEW TERMINUS—BRIEF STRIKE—COLLISION.

The new terminus of the Corporation tramways, situated in Dale-end and serving the routes of the "inner ring," has been brought into use. With its large roofs it is considered a great improvement. About 500 men engaged on the tramway reconstruction section of the Corporation relief scheme struck work on November 14 as a protest against the fact that they were paid only 75 per cent. of the standard wage. The dispute was, however, settled the following day, when a deputation of the strikers waited upon the Tramways Committee. It had previously been explained to the men by Mr. J. McDonnell (assistant manager and traffic superintendent of the tramways) that the wages were fixed by the Unemployment Grants Committee, and neither the Tramways Committee nor the City Council had power to alter the rate. The strikers' deputation pointed out that a large proportion of the men had, for long periods, been employed on permanent way work for the department and were fully skilled. The committee thereupon decided that all men who had been employed in works connected with the permanent way of the tramways during the past six months and were fully qualified should receive the full standard rate of pay. The men agreed to resume work next day. A motor car travelling along Birchfield Road about 10 p.m. on November 11 collided head-on with a Corporation tramcar. The driver of the motor car was killed, five of the occupants injured, and the vehicle reduced to matchwood. At the inquest the driver of the tramcar said the motor car suddenly swerved into the track. He brought the tramcar to a standstill within three and a half yards. As a result of the impact he was thrown against the door of his vehicle and dazed for some minutes. In returning a verdict of "Accidental Death," the coroner entirely exonerated the tramcar driver.

BLACK COUNTRY.

FUTURE OF THE TRAMWAYS.

The Birmingham and Midland Joint Committee of Electricity, Tramways and Motor Omnibus Undertakings propose to promote a Bill in the forthcoming session of Parliament with the object of continuing to operate the Black Country tramways as one undertaking. In a letter to Dudley Town Council the committee stated, however, that if the local authorities concerned were considering the promotion of a Bill themselves to form a Joint Board with a view to acquiring and operating all these tramways, the Joint Committee would be willing to co-operate with the local authorities to that end.

BOURNEMOUTH.

TRACK RECONSTRUCTION.

The Corporation have decided, on the recommendation of the Tramways Committee, that application be made to the Ministry of Transport for sanction to borrow £41,000 for the purpose of relaying several portions of the track, introducing a loop line at the junction of St. Swithun's and Southcote Roads, doubling the line between Ashley Road and Parkwood Road, and to meet the extra amount due to increased wages and materials. The relaying of track between Lansdowne and the Horse Shoe and from Fisherman's Walk to Christchurch is to be deferred owing to the cost of the work. The reconstruction of the track at Boscombe is proceeding.

BURTON-ON-TRENT.

INQUIRY INTO TRAMWAY ACCIDENT.

Major Mount, R.E., conducted an inquiry on November 10 into the accident in Station Street on November 3, when a Corporation tramcar fouled the points and overturned. Eighteen passengers met with minor injuries. The driver said the car took the points at between four and five miles an hour. When the front wheels had taken the points satisfactorily he noticed something was wrong, and felt that the rear wheels were right off or had taken the wrong track. He applied his hand-brake hard, but this had no effect on the rear, which seemed to swing round across the road, and then toppled over. The Inspector, examining the plans, said the fact that there was no sign of derailment until the car got to a certain point showed that the axle must have been broken before it reached the points. The tramways engineer (Mr. T. Hall) said he thought an axle broke just as the car was passing over the points. It was stated that 18 axles had broken on Corporation cars during last year and 13 during the ten months of the present year. Before the war there was an average of two broken axles per year. The Corporation were now trying a new type of axle on the old cars. Councillor A. J. Thornley, who was a passsenger on the top deck, said it struck him particularly that there was no blame attaching to the driver, who did everything possible to avoid an accident.

CHELTENHAM.

STRIKE SETTLED.

The strike of employees in the service of Cheltenham and District Light Railway Company, which commenced on November 5, was settled in less than a week, when terms were mutually agreed upon. The men ceased work as a protest against the proposed extension of hours from 48 to 54 and the intention to cease overtime pay at time-and-a-quarter. The agreed terms were—(1) That the 48 hours agreement stand in its entirety; (2) the men agree to a reduction of 3s. per week (instead of their offer of 2s.) on the standard weekly wage for the next 13 weeks; (3) that when the next reduction of wages under the sliding scale agreement takes place, whatever the reduction might be, the general manager agrees to take off 1s. less per week than the specified amount; (4) that every employee be reinstated in his old position, and no victimisation take place.

GLASGOW.

PROPOSED TRAMWAY EXTENSIONS.

The Corporation have issued notice of their intention to apply to the Secretary for Scotland on or before December 17 for a Provisional Order to authorise them to extend the tramway system, establish omnibus services to places outside the city, and to give them certain other powers, including penalties for the emission of smoke; prohibition of "non-smokeless" fuel; and for the amendment of statutes relating to the carrying of lights by vehicles. The intended tramways and tramroads will be situated in or pass from, through, or into the parishes of Glasgow, Old Monkland, Govan, Eastwood, Paisley, Renfrew, and New Kilpatrick, the city, the burgh of Coatbridge, and the counties of Lanark, Renfrew and Dumbarton. The tramways and tramroads will be laid with double track. At a meeting of the Tramways Committee the question was considered of acquiring Airdrie and Coatbridge tramways undertaking, and the committee agreed to recommend the Corporation to take over the Parliamentary powers of the Trustees under the Airdrie and Coatbridge Order of 1921, and to work the tramways in the two burghs as part of the Glasgow Corporation system. The Airdrie and Coatbridge line extends to 3·63 miles—made up of 2·32 miles of single track and 1·31 of double track. Under the Tramways Order referred to, the price to be paid to the Company is fixed at £77,500, plus £4,750 for stores, making a total of £82,250. "Work on an extension of the tramway line from Baillieston to Langloan has been started by the Corporation Tramways Department," says the *Glasgow Herald*, "and, provided the Corporation approve the acquisition of the Airdrie-Coatbridge tramways and the necessary Parliamentary powers are granted, two important industrial centres in Lanarkshire should be linked up with the city on December 19. Meantime the Airdrie-Coatbridge tramways will be worked independently."

HALIFAX.

PENNY FARES PROPOSED—EMPLOYEES' CONCERT.

The Tramways Committee have decided to recommend the Town Council to abolish the present transfer system and to institute 1d. stages instead, each stage to be half the length of the present 2d. stages. The committee hope that the change will increase the income by £10,000 a year. The mayor (Alderman T. Hey), in acknowledging his re-election by the Town Council, reviewed the position of the tramways (of which committee he is chairman), and the deficiency of the last financial year. It was, he said, a matter of great urgency to institute an inquiry into the incidence of fares, and to consider whether the recent increases had been wise in the light of experience. The number of passengers carried last financial year showed a reduction of nearly 2½ millions, or 9·4 per cent. This reduction was directly traceable to the revision of stages, which was equal to an increase in fares—instituted in December, 1919. Additional revenue would have to be obtained. The result of the last fares and stages adjustment was not such as was anticipated, the percentage increase in revenue being only 5 per cent., and the loss of passengers 21·8 per cent. As a result of the 13th annual concert of the Corporation Tramways and Electricity Employees' Social, Athletic, and Benevolent Society, £132 will be devoted to various local charities and to the employees' benevolent fund. The aggregate amount raised by these concerts is now £1,190.

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LEEDS.

POSITION OF THE TRAMWAYS.

Alderman R. A. Smithson, chairman of the City Tramways Committee, in an interview with a representative of the *Yorkshire Post*, remarked that he feared the people who criticised the tramway service did not allow the tramway management enough time for recovery from the general unsettlement caused by the war. Everything had changed, especially the incidence of what all classes of passengers required from the tramway service. Under the 1919 agreement a man engaged for special journeys was entitled to a full week's wages, and the hours of the working week of the regular staff had been reduced to 48 hours. This made it necessary during the rush hours of traffic to run fewer long distance journeys. During the thirty-one weeks ended November 2 the average daily deficit of the department was £208. They had derived a slight benefit from the first reduction of wages in August last, and they hoped for further savings from the more recent adjustment, but even with these savings and some improvement in earnings the existing deficiency would not be met.

LIVERPOOL.

PROPOSED NEW ROUTES.

At the meeting of the City Council on December 7, proposals for important tramway extensions, including, principally, one through the outer roads of Prince's and Sefton Parks to Allerton, were submitted by the chairman of the Tramways Committee (Mr. F. C. Wilson). He mentioned that a special meeting of the Council would be held on December 21 to consider the matter, and urged the necessity of bringing every portion of the city into quick communication with the central portion and the docks. It was no use connecting surburban tramways along the congested roads where tramways already existed. Routes must be found where cars could travel in safety on tracks reserved for them. Such tracks had been tried in Liverpool with great success, with a remarkable immunity from accidents. A rich harvest would follow swiftly on the carrying out of these tramway undertakings. This would enable Liverpool to return sooner to the old fares, which were, he believed, the lowest in the country. An amendment by Sir Archibald Salvidge to omit the proposed Parks' route was carried.

LONDON.

L.C.C. AND "UNDERGROUND" PROPOSALS—REDUCED FARES—TRAMWAY MEMORIAL—COMPANY'S LEASE—RAILWAYS COUNCIL.

At the meeting of the County Council, on November 22, the Highways Committee reported that the Council's representatives had met the London members of Parliament and placed before them certain aspects of the proposals of the London Underground group of companies as they affected the Council's interests as the tramway authority for London. The conference took place in the House of Commons on November 9, and the following representatives attended on behalf of the Council—The chairman of the General Purposes Committee, Mr. J. W. Gilbert; the chairman of the Finance Committee, Mr. J. M. Gatti; Messrs. H. Gosling, G. H. Hume, and the Rev. Dr. Scott Lidgett. Mr. J. D. Gilbert, M.P., presided over the meeting of the London members, and Mr. Hume made a statement on behalf of the Council. Mr. Gilbert undertook that the matters raised should receive careful attention.

Mr. W. J. Squires, chairman of the Highways Committee, said penny fares and the new scale of distances would come into force on December 1. At present it was not proposed to reintroduce ½d. fares for children, but the distance over which children could travel for 1d. would be increased to 2½ miles. The question of fares was continually being considered by the committee, and it required very careful handling. It was inadvisable to anticipate any decision as to further changes. At the Holloway car shed of the L.C.C. a war memorial tablet, which contains the names of 25 employees, was unveiled and dedicated by the chairman of the Council, Major Percy C. Simmons, who was assisted by the chairman of the Tramways Committee, Mr. W. J. Squires, Brigadier-General W. W. Warner, C.M.G., Lieut.-Colonel A. C. H. Kennard, the Rev. J. Scott Lidgett, and Mr. A. L. C. Fell, C.B.E., general manager of the tramways. Owing to the success of cheap return fares on their Tooting and Hampton Court route, the London United Tramways have extended the facility to the Richmond Bridge and Kingston route. The return tickets are available between Richmond Bridge and Twickenham and Kingston at all times of the day and on all days of the week except Sundays. The single fare to Kingston from Richmond Bridge is 6d., and from Twickenham Junction 5d. The return fare is now 9d. On the Tooting and Hampton Court route, return tickets are issued every day of the week except Sundays (instead of Mondays to Fridays only, as hitherto). Middlesex County Council decided on November 24, after a long discussion, to negotiate with the Metropolitan Electric Tramways, Limited, in connection with the company's proposals for an extension of the lease for a further period of 20 years, to enable the company to raise money to deal with a number of necessary improvements and renewals. The existing agreement expires in 1930. A council is being formed in London to deal with all questions of wages, bonus, and conditions of service affecting the traffic, clerical, control, and engineering staffs within the Underground group. The scheme is the outcome of an agreement between the Underground Railways and the railway trade union representatives. The T.O.T. Philharmonic Society, composed of employees of the London Underground Group, gave their fifth grand evening concert in the Central Hall, Westminster, on November 9. A large number of directors and officials of the company and their friends were present.

MANCHESTER.

END OF STRIKE.

The maintenance staff of the Corporation tramways, who struck work as a protest against the reduction of their wages by 2d. and 1½d. an hour for skilled and unskilled workers respectively, subsequently accepted the Corporation's offer of arbitration and returned to work.

NEWCASTLE.

PROPOSED LONGER WORKING WEEK—M.T.A. CONFERENCE.

The City Council on November 23 received a deputation from the tramway employees to express opposition to the proposal of the Tramways Committee to increase the working week from 44 to 48 hours. Mr. H. E. Clay argued that such increase would only mean further unemployment and would put Newcastle on a lower scale as regards hours and wages than less important towns. The Council, when they voted the 44 hours week, evidently did so thinking they were giving reasonable hours of service. To alter these now would be a breach of privilege on the part of the Council. Mr. J. H. Little, of the Amalgamated Engineering Union, contended that it should be the purpose of the Council not to reduce the purchasing powers of the people or to extend working hours, but to increase purchasing capacity and still further to reduce hours. Such policy, he said, was in harmony with the Government's attempts to absorb the unemployed. The Lord Mayor said the statements of the deputation would be carefully considered. The Transport and Electricity Committee, whose chairman, Alderman R. Mayne, is president of the Municipal Tramways Association, have decided to invite the Association to hold their annual conference in the city next September.

PAISLEY.

PROPOSED PURCHASE OF TRAMWAYS.

Glasgow Corporation Tramways Committee decided on November 23 to recommend the Town Council to offer £200,000 for the Paisley and District Tramway Company's undertaking, which in the event of purchase would be worked in conjunction with the city system.

READING.

PROVISIONS OF CORPORATION ACT EXTENDED.

The time for the completion of certain tramway routes under the Reading Corporation Act of 1914 has been extended to July 31, 1922.

SHIPLEY.

ELECTRICITY AND TRAMWAY STATION.

An interesting ceremony took place at the Dockfield Electricity and Tramway Power Station of Shipley Urban Council on November 19, when the chairman of the Council, Councillor F. F. Rhodes, started a large new rotary converter. This machine, which is capable of dealing with a 1,000 KW. load, was made by the English Electric Company at their Stafford works. It embodies a number of the firm's latest improvements, and is regarded as a highly efficient power unit. Councillor Rhodes, who had invited the other members of the Council to the ceremony and afterwards to tea, commented on the fact that the machine was not the first made for Shipley by one section of the company, two 1,250 KW. alternators having been supplied in 1914-15. These had given excellent service, often under severe conditions, without any trouble. He also dwelt shortly with the steady progress of the electricity department, which has now over 1,500 customers, and prophesied that after the depression in trade had passed, the consumption of electricity would increase rapidly and consistently.

SOUTH WALES.

PROPOSED LIGHT RAILWAY.

The promoters of the Gower (Glamorganshire) Light Railway have received the support of the local Rural Council in their efforts to obtain Government assistance towards the construction of the undertaking.

WIGAN.

POLICE PRIVILEGES ON TRAMWAYS.

The Watch Committee have reviewed the present practice of allowing policemen to travel free on the Corporation tramcars, and have recommended that in future a sum equivalent to one single fare per day, per man, should be paid to the tramways in respect of this privilege.

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TRAMWAY CHAIRMEN FOR 1921-22.

Municipal Tramway Committees have now been appointed for the ensuing year, and we append a list of the chairmen and vice-chairmen. New appointments are indicated by an asterisk.

Town.	Chairman.	Vice-Chairman.
Aberdare	*Coun. R. L. Berry ...	
Aberdeen	Coun. D. W. Beaton...	
Accrington... ...	Ald. T. E. Higham ...	Coun. F. Lord
Ashton-under-Lyne	Ald. R. S. Oldham ...	Ald. C. H. Waterhouse
Ayr	Bailie J. Smith	Coun. T. Murray
Bacup	*Coun. J. Ireland ...	Ald. J. H. Lord
Barking	Coun. A. Whiting ...	
Batley	Coun. F. W. H. Auty	*Coun. J. W. Schofield
Belfast	Coun. W. G. Turner	Coun. D. Anderson
Bexley	*Coun. A. J. Franklin	
Birkenhead ...	Coun. H. Halsall ...	Ald. S. Vaughan
Birmingham ...	*Coun. F. Smith	
Blackburn	Ald. C. Higham ...	*Coun. G. Burke
Blackpool	Coun. H. Brooks ...	Coun. T. G. Lumb
Bolton	Coun. J. R. Horrocks	Ald. P. Higson
Bournemouth ...	Coun. J. Wilson... ...	Coun. W. H. Ridout
Bradford	Ald. E. Priestley ...	*Coun. Taylor
Brighton	Ald. J. Lintott	
Burnley	*Coun. L. Thornber ...	*Coun. Eastwood
Burton-on-Trent	Ald. J. S. Rowland ...	Ald. T. E. Lowe
Bury	Ald. T. S. Collinge ...	Ald. H. Hargreaves
Cardiff	Coun. S. O. Jenkins ...	*Coun. A. E. Gough
Chester	Ald. J. Jones	Coun. A. S. Dutton
Chesterfield ...	Coun. P. M. Robinson	Ald. Sir E. Shentall
Colchester	Coun. G. F. Wright ...	*Coun. T. W. Watts
Colne	Coun. J. Thompson ...	Coun. R. Knight
Coventry	Coun. E. O. French ...	Coun. J. I. Bates
Croydon	Coun. A. A. Thomson	Ald. G. J. Allen
Darlington ...	Ald. Sir C. Starmer ...	
Derby	Coun. W. Eaton ...	
Doncaster	Ald. S. Balmforth ...	Coun. T. Bramworth
Dover...	Coun. Barwick ...	Coun. Thomas
Dundee	*Coun. J. G. Fraser ...	
East Ham... ...	*Coun. H. I. Rolf ...	*Coun. H. N. Ridley
Eccles	Coun. Alexander ...	Ald. Pearson
Edinburgh ...	*Coun. C. J. M. Mancor	
Erith	Coun. W. F. B. Howell	
Exeter...	*Coun. F. Chick ...	*Coun. W. Brock
Farnworth ...	*Coun. Winter	Coun. R. H. Cunliffe
Glasgow	Bailie John M'Whirr...	Bailie R. Laing
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Haslingden... ...	*Ald. Russell	*Coun. Worsley
Heywood	Ald. J. Ashworth ...	*Coun. Nuttall
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Nottingham ...	Coun. J. Clarkson ...	Ald. A. Turney
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St. Annes-on-the-Sea	Coun. A. E. H. Lee ...	
St. Helens	Coun. A. Rudd	*Coun. J. Hewitt
Sheffield	Ald. Sir Wm. Clegg ...	Ald. W. C. Fenton
Southampton ...	Ald. F. A. Dunsford	
Southend	Coun. G. Radford	
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South Shields ...	*Coun. J. G. Winskill	*Coun. Stephenson
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West Hartlepool	Ald. Martin	Coun. Turnbull
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Wolverhampton	Ald. Sir S. Craddock	Coun. Davies
York	*Ald C. W. Shipley ...	*Coun. J. E. Gibbs

BUSINESS NOTICES.

The B.E.A.M.A. Cable Code for electrical and allied industries has been published. The price is five guineas net.

The Anti-Attrition Metal Company, Limited, have closed their city offices at 35, Queen Victoria Street, E.C., and have opened more extensive premises at 1, Victoria Street, Westminster, S.W.1.

English Electric and Siemens Supplies, Limited.—The registered offices of this company have been transferred to their city offices, 38 and 39, Upper Thames Street, E.C.4, to which address all communications should be sent.

Henley's Wiring System.—W. T. Henley's Telegraph Works Company, of Blomfield Street, London, E.C.2, have issued an admirable booklet giving hints and diagrams on wiring by their well-known system. Thirty-two diagrams of connections, both of the familiar and more rare types, are given. Section I. deals with the "looping-in" principle and Section II. contains diagrams relating to joint boxes A chapter on the use of Rawlplugs is also included. The booklet, which is bound in a durable stiff-board cover, should prove of value to all wiremen.

Tenders for British Trade Ship.—The directors of the British Trade Ship, of which Earl Grey is chairman, announced in November that provisional tenders were being obtained by the builders of the ship for the various parts and fittings. Exhibitors who are in a position to supply some part or fitting as an exhibit actually in use on board, quite apart from their display in the exhibition proper, are naturally anxious to have their products accepted for this purpose, it was stated. At Wallsend-on-Tyne, where the ship will be built, and at the offices of the British Trade Ship, 12, Grosvenor Gardens, London, the examination of specifications was taking place with a view to determining the market value of each part and its exhibition value to the supplier.

Tramway Supplies, Limited, of Grove Mills, Meanwood, Leeds, ask us to state that in order to deal more efficiently with their rapidly growing business in the south for both home and export requirements, they have opened an office at 93 Cannon Street, London, E.C.4, and have appointed Mr. Reginald Cox, late of the English Electric and Siemens Supplies, Limited, as manager. Mr. Cox has had many years' experience in tramway equipment requirements, and is fully qualified to deal with technical points or suggestions, as well as with the business details of prices, etc. In addition to their well-known point controllers, overhead and car equipment lines, Mr. Cox will also handle the range of high-class oil switches manufactured by the Tramway Supplies Company, comprising low, high, and extra high tension gear for all purposes, together with suitable high and low tension cable boxes and sub-station switch gear, fuse panels, etc.

New Indian Tramway.—The Dehra Dun-Mussoorie Electric Tramway Company, Limited, has been registered with the object of constructing a tramway between Dehra Dun and Mussoorie. The U.P. Government has granted a concession. The capital of the company is Rs. 50 lacs. The preliminary estimate is Rs. 36,62,000. The managing agents are Messrs. T. Beltie Shah (Gilani), Rajpur Road, Dehra Dun, U.P.

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PERSONAL.

Councillor H. K. Beale has been re-elected chairman of the Birmingham Electricity Supply Committee.

Councillor James Thompson, who has been re-elected Mayor of Wolverhampton, is chairman of the Corporation Electricity Committee.

Mr. J. R. Gott, who has been assistant to the traffic superintendent of Blackpool Corporation Tramways, has been appointed general assistant to the traffic manager of the Calcutta tramways.

Mr. T. P. Strictland, assistant chief electrical engineer of the New South Wales Railways and Tramways Department, has been appointed chief electrical engineer to the Melbourne Metropolitan Tramways Board, at a salary of £2,000 a year.

Sir A. Kaye Butterworth is to retire at the end of the year from the post of general manager of the North Eastern Railway Company, which he has held since 1906. He will be succeeded by **Mr. R. L. Wedgwood,** the present deputy general manager.

Mr. James Edgar, hitherto chief technical assistant in the electricity department of South Shields Corporation, has been appointed electrical engineer at a salary of £700 per annum, in succession to Mr. E. Moxon, now borough electrical engineer of Southport.

Mr. R. L. McCulloch, who went to Australia a short time ago, has been appointed general manager of the City of Hobart (Tasmania) Municipal Electric Tramways, at a salary of £750 per annum. He was formerly chief engineer of the North of Scotland Power and Lighting Company.

Lord Southborough, P.C., G.C.M.G. (formerly Sir Francis Hopwood), has been elected an honorary member of the Institution of Electrical Engineers. He has been prominently identified with the problem of railway electrification, is a director of the London Underground Railways, and served on the Royal Commission on London traffic.

Viscount Peel, G.B.E., has been appointed Minister of Transport, unpaid, in succession to Sir Eric Geddes, whose resignation was announced on October 18. Mr. Neal, Parliamentary Secretary, has since been in charge of the Ministry, but it was stated that it was found necessary to fill the office of Minister in order that essential documents might be signed. Lord Peel is the Chancellor of the Duchy of Lancaster, to which office a salary of £2,000 is attached.

Mr. Richard Hoggard has been appointed general manager of the Lincoln Corporation tramway and motor omnibus undertaking, as the city electrical engineer, Mr. Stanley Clegg, who has acted as tramways manager since the construction of the tramways, has now relinquished the management. Mr. Hoggard, who has previously traffic superintendent at Wigan, has been traffic manager at Lincoln for ten months. He received his training in the Sheffield Corporation Tramways department, in which he was employed for many years.

Mr. Reginald Cox, who for many years has been connected with the English Electric and Siemens Supplies, Limited, and their predecessors, has resigned his position in order to undertake the management of the London office of Tramway Supplies, Limited, at 93 Cannon Street, E.C. (telephone number, City 3014, telegraphic address, "Tramsuplim," Cannon, London). In addition to tramway requirements, Mr. Cox will handle the T.S. line of high-class oil switch equipment for all voltages, low tension distribution panels, underground cable boxes, and other manufactures.

Mr. J. B. Hamilton, C.B.E., general manager of Leeds City Tramways, who is now on a visit to the East, will be away for three or four months. At the meeting of the City Council on November 9, Alderman R. A. Smithson (chairman of the Tramways Committee) explained that Mr. Hamilton had not taken his full holiday allowance for many years and the committee had readily agreed to his request for leave of absence. He would be away three or four months. In his absence the heads of the various sub-departments in conjunction with the chairman, vice-chairman, and other members of the committee would carry on Mr. Hamilton's duties.

We regret to record the death, on November 20, of **Mr. W. McHugh,** who has been secretary of the Dublin United Tramways Company for many years.

The late **Mr. L. B. Schlesinger,** chairman of the Rhondda Tramways Electric Supply Company, the Torquay and other tramways, left estate of the gross value of £213,203, with net personality £165,762.

Lieut.-Colonel P. G. von Donop died in London on November 7. He was educated at Somerset College, Bath, and entered the Royal Engineers in 1871, and from 1889 to 1894 he served as Inspector of Submarine Defences in India. In 1899 he joined the staff of the Board of Trade as Inspecting Officer of Railways, and became Chief Inspector in 1913, retiring in 1916.

Sir Charles Douglas Fox, the eminent engineer and past president of the Institution of Civil Engineers, died suddenly on November 13, at the age of 82. Sir Douglas Fox had practised in London since 1861, and was associated with many notable engineering schemes, especially abroad, including the Cape Town and Wellington Railway, the Cape Town and Wynberg Railway, and the Rhodesian, Mashonaland and Borneo Railways. For his part in the construction of the tunnel under the River Mersey he was knighted in 1886. With Sir James Greathead he was joint engineer for the Liverpool Overhead Electric Railway, and did much for the development of electric traction generally. His firm were engineers to the Southern and Metropolitan sections of the extensions to London of the Great Central Railway, including the London terminus; to the Great Northern and City Railway, and to many other important railway schemes.

CONTRACTS AND ORDERS.

Johannesburg Municipal Council have accepted the tender of Henley's (S.A.) Telegraph Works Company for cable at £223 17s. 3d.

The Metropolitan-Vickers Electrical Company are providing two sets of Merz-Price gear and one earthing resistance to Chesterfield.

The General Electric Company (London) have secured the contract for a lifting magnet and motor generator at £1,223 for the Victorian (N.S.W.) Railways, at Melbourne.

Ayr Town Council have accepted the tender of W. Scott, Limited, Leeds, for the supply of Sandberg rails at a price of £4,138 for doubling the line from the car depot to Prestwick Toll.

Edinburgh Tramways Committee are authorised by the City Council to accept the tender of Messrs. M'Hardy and Elliott, Low London Road, Edinburgh, for 16 new car bodies, at £896 17s. 6d. each, a total of £14,350.

The Scholey Construction Company, Limited, of 56, Victoria Street, London, S.W.1, have received a contract from the Birmingham Corporation Tramways to carry out the Lincoln process of welding the fishplates to the rails.

Brown, Bayley's Steel Works, Limited, have an order for car axles from Rochdale Tramways Committee. Tenders for the supply of ten tons steel tyres were received by the committee, and the decision was left in the hands of the chairman and the manager.

Manchester's New Omnibuses.—The two double-deck omnibuses which Manchester Corporation Tramways Committee ordered a short time ago are the Model 4 (previously known as "S" type) standard London pattern, manufactured by the Associated Equipment Company, Limited, of Walthamstow.

Superstructure for L.C.C. Car Repair Depot.—It was reported at the meeting of London County Council on November 22 that the following tenders for the completion of the superstructure of the central car repair depot at Charlton were submitted to the Highways Committee—P. and W. Anderson, Limited (£91,574); W. Lawrence and Son, Limited (£92,860); J. and W. Stewart (£93,895); James Carmichael, Limited (£93,913); Holliday and Greenwood, Limited (£94,800); Patman and Fotheringham, Limited (£95,271); Allen Fairhead and Son (£95,351); Holland and Hannen and Cubitts, Limited (£95,489); Rowley Brothers (£95,494); D. G. Somerville and Company, Limited (£95,704); Prestige and Company, Limited (£96,555); Thomas and Edge (£97,980); W. Moss and Sons, Limited (£98,167); F. and T. Thorne (£98,684); Holloway Brothers (London), Limited (£98,846); J. and Company Bowyer, Limited (£101,719). The architect's estimate amounted to £93,013. The Highways Committee reported that they had accepted the tender of Messrs. P. and W. Anderson, Limited, and the committee's action was confirmed.

Switchgear for L.C.C. Sub-Station.—At the meeting of the London County Council on November 8 the Highways Committee reported that they had considered the following tenders received for the supply of high and low tension switchgear required for the rearrangement of the plant at Holborn and Streatham sub-stations—

	£	s.	d.
Sprecher and Schuh Company	13,765	13	6
The General Electric Company, Limited	14,642	7	0
†The British Thomson-Houston Company, Limited	15,056	17	0
Johnson and Phillips, Limited ...*	15,112	13	0
Ferguson Pailin, Limited	15,115	13	6
Metropolitan-Vickers Electrical Company, Limited	16,418	0	0
A. Reyrolle and Company, Limited	16,792	0	0
Park Royal Engineering Works, Limited	17,064	0	0
Bertram Thomas	17,282	4	0
Switchgear and Cowans, Limited	17,282	4	0
*The British Thomson-Houston Company, Limited	17,525	0	0
*Metropolitan-Vickers Electrical Company, Limited	18,574	15	0
Whipp and Bourne, Limited	22,305	10	0

* Alternative tender. † Accepted.

The lowest tender was not in accordance with the specification, and the committee advised that the switchgear offered by the British Thomson-Houston Company was most suitable for the Council's requirements. That company is at present supplying rotary converters for the sub-stations and the committee thought it a great advantage to have one contractor responsible for the complete erection of the sub-station plant, and they consequently advised that the tender of the British Thomson-Houston Company be accepted. The recommendation was approved.

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PATENT LIST.

Abstracted for "The Tramway and Railway World" from the Official Journal of Patents.

*** If the inventions have been communicated the names of the communicators are given in italics.

APPLICATIONS FOR LETTERS PATENT.

The number of the patent is given in brackets.

Change-speed gear-controlling means of motor vehicles (29,502)—W. G. Akhurst.
Bracket arm hangers for supporting trolley, etc., electric wires (28,963)—A. T. Craston and S. T. Quilliam.
Motor vehicles (28,811)—P. J. Grose and W. T. Grose.
Motor vehicle bodies (28,833)—P. J. Grose and W. T. Grose.
Steps for tramcars (29,365)—G. Haswell.
Enabling railway running rails to be utilised as current rails (29,520)—H. W. Jackson and E. Scutt.
Electrically driven vehicles (29,446)—G. Meyfarth.
Lifting jacks (29,348)—J. L. Mudd.
Lifting jacks (28,816)—H. W. Smith and C. Whittle.
Controller gear of electric tramcars, etc., for sanding rails (29,129)—J. F. Smith.
Coupling for tramcars (29,394)—J. Williams.
Device for automatically controlling motor vehicles (29,926)—W. L. Bamber, J. R. Ellis, and W. Sharples and Co., Ltd.
Fish-plate tramway, etc., rails (29,880)—J. W. Barratt and J. Osborne.
Lifting jack (29,921)—J. Batty.
Rail-joint compensating device (30,130)—W. V. Evans and E. C. Fuller.
Direction indicating device for road vehicles (30,172)—J. Howarth.
Motor vehicles (29,792)—O. Y. Imray (*International Motor Company*).
Gear controlling mechanism of motor vehicles (29,582)—C. E. James.

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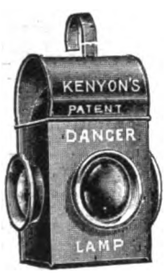

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Chair for securing rails to unperforated metal sleepers (29,604)—J. Pira.
Tramway, etc., rail joints (30,176)—H. Pope.
Change-speed gear for motor vehicles (30,156)—E. Zaparka.
Water-cooling systems of motor vehicles (30,978)—J. Appleton.
Direction indicator for motor vehicles (30,587)—H. L. Bennett.
Axle-boxes for tramcars (30,921)—T. Blaney.
Indicating distance run per unit of fuel by motor vehicles (30,742)—C. Fulton.
Motor vehicles (30,485)—J. G. Lane and A. S. Ward.
Means for cooling internal combustion engines of motor vehicles (30,956)—E. J. Mullard.
Axles of motor vehicles (30,822)—G. H. Taylor.
Power transmission for motor vehicles (31,349)—F. M. Avey.
Water-cooling radiators for motor vehicles (31,060)—H. T. Backhouse.
Direction indicator for motor vehicles (31,679)—R. Bridge.
Direction indicators for motor vehicles (31,007)—H. Entwistle and S. Jackson.
Transmission and brake control mechanism of power-propelled vehicles (31,610)—F. W. Lanchester.
Motor vehicles (31,269)—W. A. McCurd.
Transport and trailer vehicles (31,114)—G. Page.
Tramway, etc., coupling (31,463)—C. R. Phillips.
Device for governing and indicating speed of motor vehicles (31,731)—S. Shefras.
Direction indicators for motor vehicles (31,582)—A. Staveley.
Wheel for use on road or rail (31,134)—E. B. Walker.
Motor vehicles (31,736)—A. S. Watts.
Emergency braking system for motor vehicles (32,265)—H. Aves.
Tramcars, etc. (31,956)—W. P. Durtnall.
Rear axles with change-speed gear for motor vehicles (32,348 and 32,349)—G. H. Morin-Gauthier.
Fluid pressure lifting jacks (31,769)—H. Grandy and G. A. Mortier.
Motor vehicles (32,412)—H. Green.
Starting gear of motor vehicles (31,881)—J. H. Kennerley and W. E. Scragg.
Signalling devices for tramway systems (32,223)—L. H. Smith.
Brake mechanism for tramway vehicles (31,892)—C. H. Spencer.
Brake mechanism of motor vehicles (32,316)—H. Wakefield.
Lifting jacks (32,458)—W. S. Wilkins.

SPECIFICATIONS PUBLISHED

1920

Lifting jacks (11,439—*142,138*)—J. W. Rees.
Passenger vehicles (17,684—*169,780*)—A. Spencer.
Anti-creeping devices for rails (17,785—*145,615*)—L. O. Henggi.
Method of and moulds for cast welding rail bonds (19,273—*147,199*)—Rail Welding and Bonding Company.
Locomotives, cars, and like vehicles (19,850—*147,805*)—British Thomson-Houston Company, Limited.
Signalling devices for street crossings of tramways, etc. (21,598—*169,854*)—R. Zellweger and E. Zellweger.
Rail joints (25,801—*169,897*)—H. R. Mulzer.
Sand-boxes for use on vehicles (19,727—*170,080*)—J. S. Morris.
Live axle for motor-driven vehicles (21,575—*170,119*)—C. L. Heyermans.
Sanding apparatus for vehicles (13,250—*170,315*)—G. C. Bailey.
Trolley wheel guides for electric traction (21,468—*170,371*)—S. D. Master.
Motor-driven vehicles (21,611—*170,386*)—R. J. Urquhart.
Tramway vehicles (24,091—*170,448*)—Leeds Forge Company, Limited, and H. N. Gresley.
Rail joints (32,212—*170,504*)—E. C. R. Marks (*G. J. Murphy*).
Bow collectors for electric vehicles (20,505—*148,528*)—C. Conradty.
Bow collectors for electric railways in which the slip piece is adapted to turn upon its longitudinal axis (20,508—*148,531*)—C. Conradty.
Devices for driving or supporting motor or other vehicles (21,736—*170,640*)—V. Zboril.
Braking mechanism for the swivelling wheels of trailers (21,810—*154,559*)—Astra Soc. de Constructions Aeronautiques.
Route indicators for road vehicles (21,998—*170,653*, and 22,000—*170,655*)—O. E. Josephs.
Transmission control apparatus for motor vehicles (22,220—*170,669*)—A. F. Hitchcock.
Transmission of power in and to the electrical equipment of motor vehicles (23,142—*170,692*)—F. H. Bowman and R. L. Aspden.
Wheel and axle assembly for motor vehicles (25,712—*170,734*)—S. E. Alley and H. K. Pratt.
Brake and change lever pedals of motor road vehicles (26,216—*170,742*)—P. Maggs.
Bases of trolley poles for electric traction (30,959—*170,768*)—A. W. Ham.
Motor vehicles (18,098—*145,756*)—C. W. Kelsey.
Rear axle construction for motor vehicles (18,099—*145,757*)—C. W. Kelsey.
Route and station indicators (21,953—*170,913*)—A. A. Simco.
Life guards for vehicles (24,045—*170,981*)—A. T. Edwards.
Fuel consumption indicators for motor vehicles (24,763—*170,990*)—H. Fletcher.
Combined bumper and lifting jacks for motor vehicles (26,825—*151,287*)—G. Sjolander.

1921.

Alignment and jointing of rails (1,041—*171,056*)—D. L. Thomas.
Automatic coupling for railway vehicles or trams (2,600—*171,059*)—W. J. Evans.

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TRAFFIC RETURNS.

Tramway and Omnibus Undertakings in the United Kingdom.

NAME OF COMPANY OR CORPORATION.	1920. WEEKS ENDED Nov. 13	Nov. 20	Nov. 27	Dec. 4		1921. WEEKS ENDED Nov. 12	Nov. 19	Nov. 26	Dec. 3		AGGREGATE. Wks	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Aberdeen Corporation	3,637	3,569	3,629	3,614	...	3,355	3,323	3,190	3,406	...	26½	96,743	– 9,077
Aberdeen Motor Buses	...	...	...	...	...	120	119	115	125	...	26½	7,564	+ 6,809
Ayr Corporation	536	545	538	584	...	474	469	472	469	...	29	23,757	– 1,297
Barrow Corporation	893	927	861	916	...	726	728	725	719	...	35	30,730	– 1,303
Belfast City Tramways	11,272	11,124	11,358	11,654	...	12,019	12,248	11,715	11,683	...	35	443,102	+ 39,688
Birkenhead Corporation	2,699	2,732	2,707	2,782	...	2,473	2,466	2,506	2,540	...	34½	92,341	– 12,296
Birkenhead Motor 'Buses	355	356	329	343		507	492	495	488	...	34½	25 002	+ 9,815
Birmingham Corporation	33,672	33,210	32,635	34,181	...	28,551	28,717	28,614	29,353	...	35	1,032,901	– 75,401
Birmingham Motor 'Buses	1,942	1,877	1,767	1 973	...	1,692	1,678	1,664	1,728	...	35	72,248	– 45
Blackburn Corporation	2,293	2,274	2,424	2,336	...	2,301	2,278	2,314	2,175	...	35½	85,885	– 8,037
Bradford Corporation	14,057	14,104	13,520	13,841	...	13,448	13,105	13,187	13,337	...	35	484,413	+ 19,061
Burnley Corporation	2,993	3,227	3,275	3,222	...	3,248	3,182	3 252	3,189	...	—	—	—
Burton-on-Trent Corporation	605	588	580	637	...	549	562	560	554	...	35	2,228	+ 959
Bury Corporation	2.039	2,296	2,200	2.253	...	2.195	2,258	2.290	2,239	...	33½	87.794	– 3.920
Chatham and District	1,725	1,647	1,589	1.615	...	1,484	1,435	1,497	1,192	...	48	80,022	– 3,448
Chesterfield Corporation	548	575	558	585	...	590	565	569	550	...	35	20,687	+ 174
Chesterfield Motor Buses	764	763	748	811	...	802	782	750	709	...	35	27.221	– 369
Derby Corporation	2,250	2.327	2,136	2,216	...	1,941	2.187	1.989	1,976	...	35	76.554	– 4.440
Dundee City	3,159	3,223	3.080	3,109	...	3,095	3,041	3.010	3.015	...	28½	93,523	+ 7.367
East Ham Corporation	2,039	2,218	2,104	2,143	...	2,058	2,010	2,006	2.025	...	35½	74.819	+ 3.363
Edinburgh Corporation	...	...	...	...	...	11,390	11,840	11,799	11,433	...	—	—	—
Edinburgh Motor 'Buses	...	...	...	...	...	3,140	3,137	3,209	3,113	...	—	—	—
Glasgow Corporation	46,598	47,105	45,840	47,484	...	44,675	45,126	44,931	44,634	...	26½	1,215,746	+ 28,870
Glossop (Urban Elec. Supply Co.)	261	243	237	240	...	227	232	243	231	...	49	11.589	– 18
Halifax Corporation	4,448	4,291	4,298	4,129	...	4,165	4,034	3,995	4.061	...	33½	153,808	+ 5.083
Halifax Motor 'Buses	110	110	106	107	...	58	57	58	62	...	33½	2,832	– 1,040
Halifax Railless Cars	...	...	...	...	...	55	49	49	38	...	19	1.114	—
Huddersfield Corporation	5,146	5.086	4.880	5,070	...	4,761	4,796	4,822	4.814	...	36	189,938	+ 11.805
Ilford U.D. Council	1,277	1.344	1,292	1,313	...	1,364	1,346	1,335	1,349	...	35½	53,565	+ 7.404
Ipswich Corporation	838	847	803	817	...	741	728	721	706	...	35	31,254	– 4.276
Isle of Thanet	483	491	474	450	...	586	534	519	495	...	9	6,371	+ 924
Kilmarnock Corporation	343	363	345	360	...	327	336	324	331	...	28½	10,587	– 41
Leicester Corporation	6,432	6.832	6 415	6.533	...	6.642	7,167	6.957	6,983	...	48	316.388	– 892
Liverpool Corporation	26.613	25.964	25,672	26,765	...	29.174	28.739	29,013	29,393	...	48½	1.399.505	+ 85.827
London County Council	97.897	104,700	99.033	101.402	...	99,103	95,901	97,734	91.563	...	35	3.507.426	+ 337.861
Maidstone Corporation	424	412	397	392	...	409	389	394	344	...	34	17,192	– 376
Manchester Corporation	37,174	37.208	36,096	37,822	...	36.488	36,729	37,135	37.213	...	35	1.382,382	+ 195.000
Newcastle-on-Tyne Corporation	10.979	11,094	10.833	11.045	...	10,774	10,581	10.738	11.045	...	35	402,088	+ 15.525
Nottingham Corporation	7.374	7.399	7,122	7.430	...	7.367	7.127	7.266	7,117	...	35	234,099	– 39.986
Oldham Corporation	4.556	4.650	4,537	4,623	...	4,544	4,600	4,611	4.479	...	37	176,115	+ 2.943
Preston Corporation	1.852	1.862	1,769	1.876	...	1,890	1.819	1,773	1,767	...	34½	67.105	+ 4.156
Reading Corporation	1,543	1,571	1.522	1,552	...	1,505	1.435	1,459	1,412	...	35	55.990	– 2.930
Reading Motor 'Buses	224	241	224	241	...	299	268	265	236	...	35	12.245	+ 2.949
Rotherham Corporation	2.373	2.470	2.493	2.594	...	2.460	2.180	2.155	2.151	...	34	76.972	– 13.824
St. Helens Corporation	1,782	1.849	1,874	1.953	...	1.422	1.314	1.353	1.561	...	35	61,512	– 11.804
Sheffield Corporation	20.371	20,356	19.939	20.526	...	18.671	18.468	18.602	18.605	...	35½	695.815	– 46.300
Southampton Corporation	3,088	3.140	2.913	3,081	...	2.862	2,790	2.872	2,849	...	35	104,286	– 7,034
Southampton Motor 'Buses	241	339	312	327	...	100	95	93	97	...	35	5.920	– 2.382
Southend Corporation	1 615	1.630	1,546	1,518	...	1,893	1,855	1.825	1.771	...	36	95.517	+ 4.731
South Shields Corporation	1 866	1.866	1.796	1.827	...	1,623	1.648	1.652	1.648	...	36	60,402	– 8.528
Sunderland Corporation	2,893	2,810	2,788	2.855	...	2,417	2.430	2.471	2.396	...	35	93,765	– 16,299
Swindon Corporation	361	365	338	359	...	380	337	340	331	...	34½	14,150	+ 433
Tyneside Tramways and Tramroads	1,219	1.205	1,139	1,181	...	930	895	890	894	...	22	24.517	+ 4 268
Wallasey Corporation	2.234	2.233	1,995	2,188	...	2,515	2.533	2.563	2,537	...	35½	100,866	+ 8.412
Wallasey Motor 'Buses	119	111	139	116	...	160	192	174	207	...	35½	8,704	+ 2.300
Walsall Corporation	1 660	1,658	1,589	1,967	...	1,492	1,507	1.504	1,541	...	35	58,252	– 4.242
Walsall Motor 'Buses	1,062	1,130	1.060	1.331	...	811	817	829	873	...	35	33,230	– 6.443
Walthamstow U.D. Council	1,808	1,868	1,794	1.835	...	1.696	1,668	1.621	1.558	...	35	74,881	+ 1,556
Warrington Corporation	973	970	949	1.032	...	976	965	977	969	...	35	34,537	– 342
West Ham Corporation	5,283	6.298	5,957	6.328	...	5,926	5.723	6.072	5.321	...	35	207,615	+ 8.515
Wolverhampton Corporation	2.313	2.216	2,291	2,308	...	2.174	2.225	2.138	2.250	...	36	84,360	– 3.579
Wolverhampton Motor 'Buses	447	439	451	458	...	605	628	599	638	...	36	23.450	+ 7.985

Underground Electric Railways Company of London, Limited.

NAME OF COMPANY.	1920. WEEKS ENDED Nov. 13	Nov. 20	Nov. 27	Dec. 4		1921. WEEKS ENDED Nov. 12	Nov. 19	Nov. 26	Dec. 3		AGGREGATE. Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Underground Rlys. & L.G.O. Co.	...	...	...	...	...	224,030	217,065	216.062	205,308	...	48	11,359,260	—
London and Suburban Traction	...	...	...	...	...	47,706	47,168	46,299	43,174	...	48	2,631,302	—

Colonial and Foreign Tramway Traffic Returns.

Companies Issuing Weekly Returns.

NAME OF COMPANY.	1920. WEEKS ENDED Nov. 13	Nov. 20	Nov. 27	Dec. 4		1921. WEEKS ENDED Nov. 12	Nov. 19	Nov. 26	Dec. 3		AGGREGATE. Wks.	1921.	Increase or Decrease.
	£	£	£	£	£	£	£	£	£	£		£	
Anglo-Argentine	77,319	77.952	82,262	79,068	...	84.353	84,269	83.777	81.991	...	48	3,851,928	+ 184.999
Calcutta Rs.	84,830	94,738	94,544	96,250	...	10,975	11.966	72,325	92.817	...	48	3,661,259	– 797,773
Madras Rs.	(2 weeks)	48,704	(2 weeks)	42,446	...	(2 weeks)	46,251	(2 weeks)	43,605	...	44	915.870	– 172 416
Pernambuco	5 685	5,556	5,189	5,297	...	3,642	3,552	3,649	3,810	...	48½	180,420	– 138.968

Companies Issuing Monthly Statements only.

	1920. June	July	Aug.	Sept.	Oct.	Nov.	1921. June	July	Aug.	Sept.	Oct.	Nov.	Wks.	AGGREGATE. 1921.	+ or –.
	£	£	£	£	£	£	£	£	£	£	£	£		£	
Ballarat & Bendigo	3,672	3,690	3,588	4,192	4,442	...	4,134	3,842	3,809	4,231	4,682	...	28	30,388	+ 2,198
Brazilian Trac. Mirs	10874000	11745000	11837000	12043000	13442000	...	14257000	15477000	15744000	14471000	15016000	...	44	140,907000	+30800000
Brisbane	...	53,300	46,650	45,430	46,310	...	...	48,850	50,675	46.220	47,880	...	44	471,920	+ 12.590
British Columbia $	710,210	788,402	310,608	806,797	835,054	...	750,907	840,155	844,154	845,185	345,973	...	18	3,375,457	+ 134,606
Buenos Ayres L'c'z.	50,635	51,508	53,952	53,603	57,619	56,746	51,071	51,944	55,873	55,873	58.492	58,056	21	280.238	+ 6,810
Burma	50,471	52,289	48,553	50,235	55,763	...	54,275	43,764	55,168	58,974	64.778	...	13	178,920	+ 24,359
Cape Town	...	23,711	...	23,699	...	...	25,038	25,571	25,164	25,755	26.839	...	—	—	—
Carthagena & H.	5,562	4,164	3,721	2,273	3.319	2,714	1,410	1,936	1,773	4,244	3.862	1,717	48	27,815	– 16,982
Cordoba	...	20,189	21,028	19,597	19,627	...	...	23,629	23,851	23,204	23,203	...	31	162,653	+ 22,646
East India	3,862	4,081	4,109	4,228	4,299	4,234	4,078	4,591	4,513	4,154	4,054	3,945	17	16,696	– 174
Kalgoorlie	3,029	3,194	3,111	...	...	...	2,308	2,350	2,652	...	...	...	35	17,290	– 6,958
La Plata	...	5,353	5,715	5,656	6,310	5,573	...	5,425	...	...	6,587	6,453	48	58.098	– 3,652
Manila $	267,169	282.260	292.418	280,352	327,652	...	310,559	305,126	297,128	322,212	323,108	...	44	3,057,695	+ 274,175
Monte Video	39,989	39,647	42,771	41,816	45.246	43,846	42,960	42,411	44,672	44,927	47,927	47,425	4	47.426	+ 3.580
Para	25,392	24,243	24,571	23,174	26,772	...	24,884	24,655	22,940	22,225	25,548	...	48	264,667	– 7,958
Port Elizabeth	...	6,106	...	5,803	...	...	6,180	6,515	6,578	6,477	6,788	...	—	—	—
Rangoon Rs.	117,735	118,667	117,836	114,857	111,830	...	130,000	133,536	133,000	132,225	151,000	...	44	1,345,301	+ 170,016
Toronto $	1127,239	1189,315	...	...	...	...	1295,701	1229,483	...	...	...	...	31	8,877,669	+ 642,606
Winnipeg $	407,625	391,709	368,616	426,647	444,899	...	432,894	390,109	393,823	417,174	441,315	...	18	4,433091	+ 156,543

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Daimler Commercial Vehicles

The Performance of Chassis No. 3021

UNICORN BREWERY
IPSWICH
Sept. 21st 1921

To MESSRS. DAIMLER CO.

DEAR SIRS

I thought the following particulars of our Daimler 2-3 tonner, supplied by you in July, 1919, might be of interest. The Chassis No. is 3021; Engine No. 31650.

The Lorry has been running continuously for 2 years 3 months, and has totalled up an approximate mileage of 25,000. I am now having it overhauled and the first new set of tyres put on the back wheels.

The Lorry is running now as sweetly as when it was first delivered, and the following are the only repairs and replacements recorded against it:

	£	s.	d.
Adjusting brakes		2	9
¼ Greaser (lost)		3	0
Dynamo repairs		18	6
„ brushes		5	9
Repairs to magneto		16	6
4 Platinum points	1	0	6
4 Plugs	1	0	0
Carbon brush		1	0
Water pipe repairs	1	9	2
Expenses sending out to repair magneto	1	10	3
4 Plugs	1	0	0
New points		7	0
Tune engines, repairs to brakes		10	6
4 Plugs	1	0	0
Straightening starting handle		2	6
Total	10	7	5

This works out at about £4 12s. a year, a fact which speaks for itself. I cannot say how more than satisfied we have been, and I know of no other Lorry which could have done half the work at the same expense. The Lorry was supplied to us through Messrs. Lock & Stagg, of Ipswich, and they have done the few repairs &c. themselves.

We are, dear Sirs
Yours faithfully
For THE UNICORN BREWERY CO. LTD.
(Signed) CYRIL CATCHPOLE, *Managing Director*

Daimler

THE DAIMLER COMPANY LIMITED
COVENTRY

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Regd.

AEC

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For Goods - - - 3, 4 & 5 TONNERS

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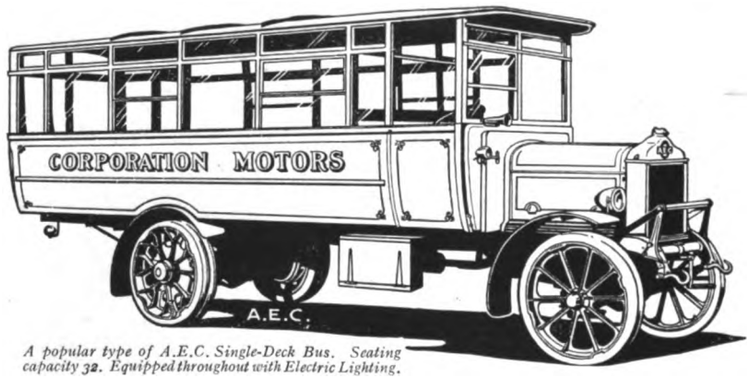

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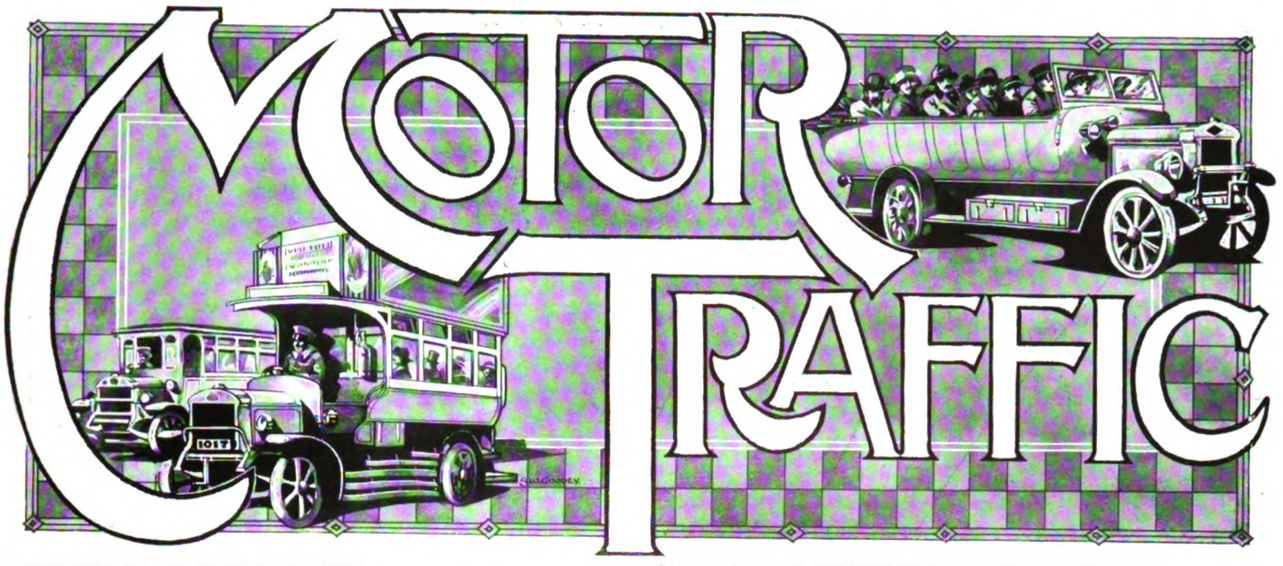

RESTRICTIONS ON MOTOR COACHES.

The size of the larger type of motor coach and its suitability or otherwise for use on comparatively narrow country roads are matters of concern to many sections of the community. Whatever endeavours may be made to get users and manufacturers of all types of motor vehicle to pull together, we are never going to persuade the car owner or the motor cyclist that a 34-seated motor coach about seven and a half feet wide, and with a big overhang, is a really charming neighbour in narrow country lanes. The overhang is perhaps a more serious matter than the width, and it must certainly be admitted that the wide swing of the tail at sharp corners has been the principal cause of a certain number of very serious accidents to road users. There have been some complaints of deliberate obstruction by motor coaches holding the crown of the road and refusing to allow overtaking traffic to pass. Any objectionable behaviour of this sort has, we believe, been far more the fault of the motor coach passengers than of their drivers. As a rule, the driver does his best to give way. If he is on a narrow road, he is afraid of going too far to the side and getting on to soft ground, with possibly serious consequences. On the other hand, some parties using motor coaches have undoubtedly made themselves very objectionable to other road users, and have given cyclists, motor cyclists, and motorists fair cause for complaint. The great majority of motorists realise that they are not the only users of the road, and that "the poor man's motor car" must be given every consideration and encouragement. At the same time, motorists are not alone in feeling that on certain roads very large motor coaches are unduly obstructive and on occasion dangerous. There are numerous local authorities which hold this view even more forcibly. We may take it that sooner or later the use of the largest type of coach will certainly be restricted to the broader highways. The smaller type, carrying not less than fourteen, and probably no more than twenty passengers, and running on pneumatic tyres, will become the standard on routes where secondary roads must be traversed. This state of affairs may come about as a result of coach proprietors themselves realising the inevitable. On the other hand, it may be the result of outside pressure in the form of regulations definitely closing certain roads to certain classes of traffic. Applications for powers of this sort to be given to local authorities will need to be opposed, but to be opposed with discretion.

SAFEGUARDING COMMERCIAL VEHICLE INTERESTS.

There is too much argument against the very big coach on narrow roads to make blank and unreasoning opposition a policy likely to succeed. In our opinion opposition, while strong, should not be unqualified, but should aim at a satisfactory compromise. The coach proprietor can so plan his routes as to avoid specific roads with his larger vehicles. He may have to cut out certain points of interest in his trips, and include these only in the runs made by the smaller vehicles, but he is certain not to be precluded from running the larger coaches at all. The position of the substantial van or lorry owner is quite different. The real utility of trade vehicles depends upon the possibility of using them for all the transport work that has to be done. If a 3-tonner cannot, owing to restrictions on road use, deliver to or take loads from all the firms' clients, then a smaller vehicle must also be kept for special jobs, and a good deal of waste mileage is involved. If the business, say, provides just about enough work for one 3-tonner, the trader then has the option of either employing two or three much lighter vans or else keeping a light van as well as the 3-tonner. Neither policy is economical. Both put up the costs of road transport, and the result in very many cases would be to make all the difference when it comes to the comparative advantages of rail or road. We must therefore strongly contest any proposals to close any roads to all vehicles exceeding some specified but comparatively low limit of weight or dimensions. To enforce such restrictions would be to penalise road transport hopelessly in competition with the railways, and very possibly to compel reversion to horsed vehicles in many cases. This latter is an obviously retrograde step. The proper compromise might therefore be to acquiesce in the closing of certain unsuitable roads to passenger vehicles having more than a specified seating accommodation or exceeding certain specified dimensions in respect of width or overhang, at the same time leaving the roads quite free in other respects, so that their occasional use by large goods-carrying vehicles would not be interfered with. The coach proprietor might perhaps consider that, if any such policy as that suggested were adopted by organisations of other classes of motor users, it amounted to a betrayal of his interests for the safeguarding of their own. If, however, as we think probable, it proves impossible to preserve to motor coaches the absolutely free use of all roads, it would be better that they should suffer

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MOTOR TRAFFIC

alone rather than that all should suffer even more seriously, merely for the sake of solidarity and without securing for the coach proprietor himself any compensating advantage.

SELECTION AND FIRST COST.

In these days of shortage of ready money and the consequent tendency to economise in immediate expenditure, even at the cost of considerable expenditure later on, the necessity for keeping accurate records of the operating costs of motor vehicles becomes more than ever apparent. We have more than once emphasised in these notes the fact that low price is not necessarily the same thing as cheapness. We would not be so foolish as to advocate the deliberate payment of high prices that are not justified by the durability and reliability of the vehicles supplied, but one can safely go so far as to suggest that every motor user should endeavour to equip himself with information of the kind that will enable him to make subsequent additions to his fleet to the best advantage. An example has recently been quoted in which a very large user of motor vans had for the time being transferred his custom from a British to a Continental manufacturer on the grounds of the lower first cost of the latter's goods which, be it said, are of high repute. The wisdom of this policy was challenged, and very thorough records were consequently kept and analysed with a view to determining definitely the correct policy for the future. The result was to show that, despite the greater first cost which was written off under the heading of depreciation, in each case the British vehicle showed a total operating cost of almost sixpence a mile less than the foreign vehicle, though the carrying capacity and consequently the average load of the latter was somewhat smaller. Now a saving of sixpence a mile means a saving of £400 per annum on a mileage of 16,000 miles, which is approximately that covered in the instance under consideration. The firm in question uses well over twenty vans of approximately 1 ton to 30 cwt. capacity. The difference in annual cost according to the choice of make of van is therefore not less than £8,000 per annum. This is obviously an enormous figure as compared with any apparent saving that could possibly be effected by purchasing vehicles more cheaply in the first instance. Putting the same fact in another way, we have a saving of £2 a day on each vehicle, assuming a mileage of 80 per day.

In face of such facts as these, it is a very open question whether a user who has got first-class vehicles, and is getting first-class results from them, can afford the experiment of purchasing in what is certainly a cheaper and what he hopes may be an equally good market. If his hopes are justified, well and good. If not, he may sacrifice a very large sum of money and continue to do so for a considerable period of years.

RECORDS OF PERFORMANCE.

Now to get back to our principal point. It is quite evident that a user who does not keep records cannot ascertain such facts as those quoted above. He may, of course, get second-hand information from other users, but this is not infrequently misleading, because many people keep records which are incomplete, and therefore sometimes worse than useless. Even the figures quoted above do not provide all the information that may be required. For example, some particular type of vehicle may be cheap to run, but may be subject to small troubles, not expensive to remedy but causing frequent loss of punctuality. In some businesses this may not be very important; in others it is certainly vital. The retention of business often depends on the certainty of the service given, just as much as on the cost of it. If, through the unreliability of vehicles, goods urgently needed at a certain time arrive late, the supplier loses goodwill, the value of which is not easily assessed, but is certainly large. Records should therefore include accurate chronicles of the number and duration of delays on the road as well as their cause and the cost of the repair work involved. Complete records have value other than as the basis of comparisons with a view to further purchases. If, for example, the tyres of some particular vehicle consistently wear out rapidly as compared with those of other similar vehicles, the records reveal the fact, and, so to speak, suggest an investigation which will very probably indicate a cure of the trouble. The same value applies to records which show a comparatively unsatisfactory fuel consumption on some particular machine. In fact, if full records are kept and systematically supervised, all sorts of little unnecessary wastes will be eliminated one after the other. By telling us what is wrong, they show us that it needs to be put right, and once the existence of the trouble is recognised the remedy is nearly always within reach.

Records should obviously show the approximate loads carried, as otherwise comparisons between different vehicles may be unfair. They will, of course, show also the approximate mileage covered, without which they must be almost useless. They will help to indicate the comparative efficiency not only of vehicles but of drivers. In any concern of considerable size quite substantial expenditure on keeping full records is more than justifiable. Even in the case of the small user, the trouble involved is well worth while. The records act as an insurance against small wastes all the time, and against misjudged waste of capital when fresh vehicle purchases become necessary. If all users kept full records, the variety of vehicles upon the road would be much reduced, since numbers of those which are at present reasonably popular because of their low first cost, or for other reasons, would be eliminated. Meanwhile the really good models would be fully established in public favour. In consequence their manufacturers would be able to produce and sell them in larger quantities, and on this account, again, the cost of production would go down and the vehicles would be purchasable at lower prices.

RENEWAL OF MOTOR LICENCES.—Owners of mechanically-propelled vehicles are reminded by the Ministry of Transport that they must produce their registration books on application for the renewal of licences for 1922. To avoid inconvenience to themselves and delay in obtaining licences, they should satisfy themselves that they have the book available for production, and that it is in order. In any case where it has not come to hand or has been lost, the matter should be immediately taken up with the appropriate licensing authority with a view to the book, or a duplicate, being obtained before the new licence is applied for.

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MOTOR TRAFFIC

MOTOR TRANSPORT YEAR BOOK.

A glance at the sixth annual issue of the Motor Transport Year Book and Directory (The Electrical Press, Ltd., Fisher Street, W.C.1, 22s. 6d.) serves to set the reader wondering at the astonishing growth of the motor transport industry. The total number of undertakings recorded in the issue for 1921-22 is 3,030, as compared with 617 in the inaugural volume. The increase over 1920 is 1,705. The Introduction and General Survey is devoted to a *résumé* of law and regulations governing public motor services; with summaries of reports and announcements issued by Government Departments, committees, and other official bodies; and brief comments on subjects of topical interest.

The following are a few of the special subjects dealt with—Statistical summary reviewing the progress of the year; Railways and road transport—Railways Bill, 1921; Plying for hire; Extraordinary traffic; Restriction of traffic on specified roads; Lights on vehicles committee; Road direction posts and warning signs; The present position of power alcohol; Roads Act, 1920—New scale of licence duties; Motor Tax Account, 1921.

The four sections that follow deal with (1) motor transport undertakings from financial, commercial, and descriptive aspects, the undertakings having a geographical index; (2) financial and commercial information of the manufacturing companies providing the vehicles and accessories required for these transport services; (3) the aims, objects, and constitution of the associations and societies connected with the industry, and particulars relating to traffic bureaux, coach stations, and selected fuel, insurance and hire purchase companies; and (4) names and addresses (numbering nearly 6,000) of the directors and officials engaged in transport services and motor manufacture.

The motor operating undertakings account for 1,888 of the total of 3,030, and comprise 1,280 joint stock and Parliamentary companies, 508 private firms, and 100 municipalities, including those applying for powers in the present session of Parliament. How great is the advance in all forms of road transport is revealed by a comparison of these figures with the records of previous volumes. The number of motor vehicles in service, according to the definite figures supplied by 466 transport undertakings, is 11,586, the companies accounting for 10,937 of these, and the municipalities for 649.

DOUBLE-DECK MOTOR OMNIBUS FOR HUDDERSFIELD CORPORATION.

In order to meet the increased traffic requirements on certain omnibus routes, the Huddersfield Tramways Committee have purchased for service on their Bradley-Ravensthorpe route another omnibus of the double-deck type, with seating capacity for 47 passengers. This type of omnibus is rapidly finding favour with the travelling public.

From the accompanying illustrations it will be seen that the design of the body gives evidence of great care and thought, and presents a pleasant appearance. The chassis is of the 3-4 ton "K" type, 50 H.P., by the well-known firm of the Karrier Motors, Limited, of Huddersfield, and is fitted with all the latest improvements.

Double-Deck Motor Omnibus for Huddersfield Corporation Tramways Department.

The bodywork is by the Blackburn Aeroplane and Motor Company, Limited, Olympia, Leeds, and both for quality of material and workmanship leaves little to be desired. The framing, including pillars, rails, etc., are of selected English ash, morticed, tenoned, ironed, all joints being set in white lead. The roof is supported on ash hoop sticks, strengthened with steel plates extending across the body, and supplemented by stanchions, the inner roof being finished in natural varnished pine. Special attention has been paid to ventilation. All inside seats are constructed on the spring system, and are covered with red leather. The outside seats are of the ever-dry type framed in ash. The general finish of the vehicle is quite in keeping with the high-class coachwork of this firm.

It is interesting to note that the Huddersfield Tramways Committee is about to purchase a number of additional omnibuses to put into service in the spring of 1922.

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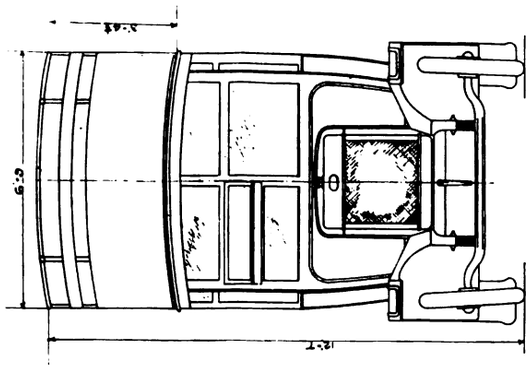
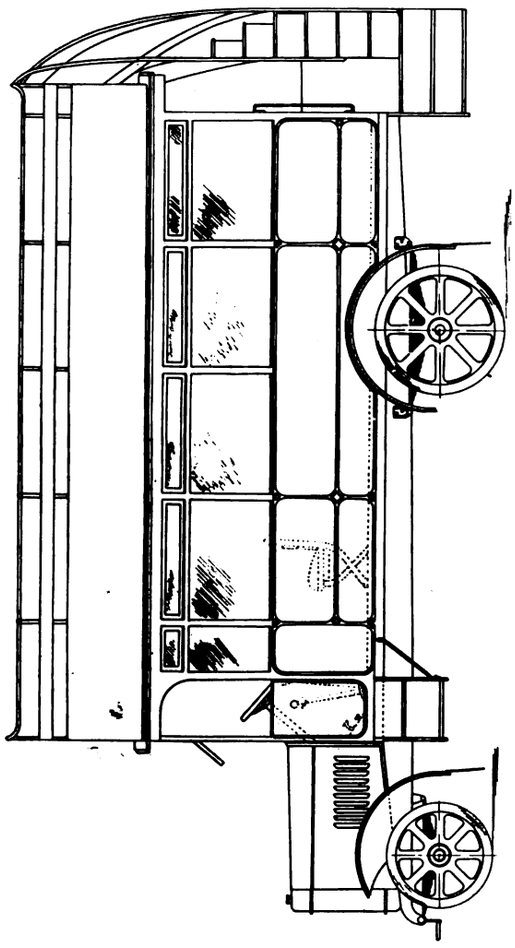
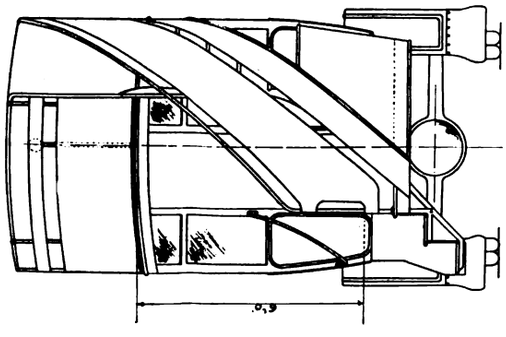
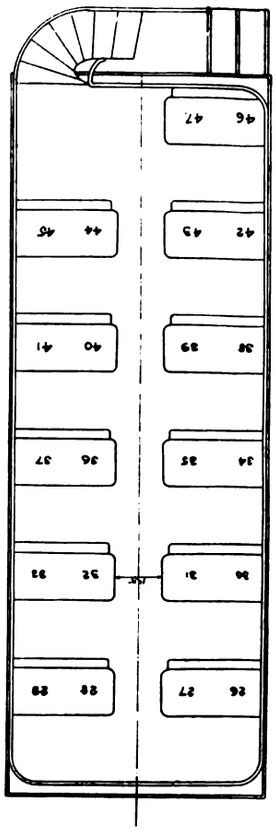
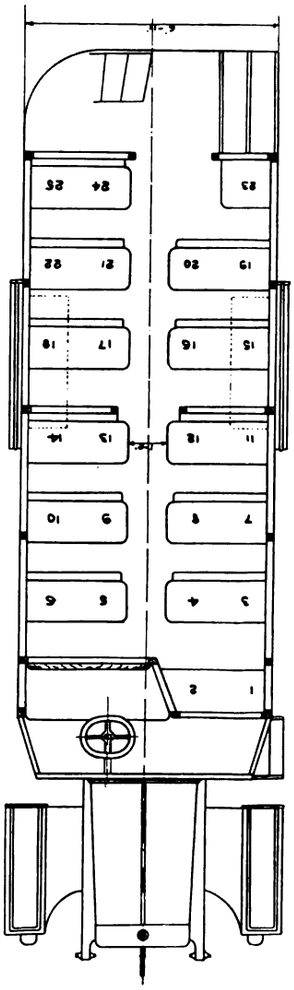








Plan of Upper Deck.



Plan of Lower Saloon.

Double Deck Motor Omnibus for Huddersfield Corporation Tramways Department.

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PUBLIC WORKS CONFERENCE.

INAUGURAL PROCEEDINGS AT THE LONDON AGRICULTURAL HALL.

The Public Works, Roads, and Transport Congress was held from November 17 to 25, being opened by Mr. Arthur Neal, M.P., Parliamentary Secretary to the Ministry of Transport. There was a large attendance, presided over by Sir H. P. Maybury, chairman of the Congress Organising Committee, and Director-General of the Roads Department, Ministry of Transport.

A number of papers dealing with various subjects were read and discussed during the congress, and outlines of those of immediate interest to our readers are subjoined.

BENZOL FOR TRANSPORT PURPOSES.

Captain E. DE NORMANVILLE dealt with the above subject. He warned users against accepting a fuel that did not come up to the specification of the National Benzol Association, as it would not prove a success. The practical advantages of benzol were—(*a*) More power, (*b*) increased mileage, (*c*) no pinking, (*d*) economy of use, (*e*) "sweeter" running, (*f*) home produced. In the face of so many valuable advantages one was not afraid to record what the opponents of benzol had stated to be disadvantages. The alleged disadvantages, (*a*) higher freezing point than petrol, (*b*) lower volatility, (*c*) stronger solvent than petrol—and the greatest of these the last. Ample provision was made for the elimination of freezing troubles under all normal weather conditions in this country by the addition during manufacture of from 10 to 20 per cent. of toluol. With regard to volatility, that bogey could be met on commercial vehicles and cars without self-starters by covering the bonnet and radiator with a large rug in order to keep as much heat as possible. The author enlarged on each of the advantages of benzol, and on the economic factor remarked that at the present time the retail cost of benzol was about 20 per cent. more than petrol, so that with a 20 per cent. better mileage the two fuels were about equal on the mileage basis. Owing to the shutting down of furnaces because of the coal strike, the supply of benzol at present was limited. With a pick-up in industrial activity the output from coke-ovens would increase. As gasworks were no longer under control, they must look for cheaper gas oil and washing acids before a material increase of benzol could be expected from these undertakings.

CARE AND UPKEEP OF ROAD APPLIANCES.

Mr. H. T. CHAPMAN, county surveyor of Kent, was unable to be present to read his paper dealing with "The Care and Upkeep of Road Appliances, Including the Establishment of Depots." The author pointed out that many advantages and considerable economy were derived from highway authorities possessing the plant necessary for carrying out repairs, maintenance, improvement, and scavenging of roads. The work had become a much more exact science than it was formerly, and could not be executed efficiently and economically without the necessary appliances, which highway authorities would be well advised to obtain in the most suitable and up-to-date type. Generally it would pay authorities to appoint a transport officer under the engineer and surveyor.

Mr. GETTINGS (Worcester) said that in the present days of difficulty in obtaining lodgings for men it was an advantage to have a sleeping van capable of accommodating four men. The whole question must be treated strictly on commercial lines, because as soon as a public authority established a depot they were liable to be accused of entering upon municipal trading.

Colonel E. S. SINNOTT (Gloucester) said they were indebted to Sir Henry Maybury for allowing them to acquire at reasonable prices the war plant that came from overseas.

Mr. WYATT (Grimsby) said his authority had just received permission from the Ministry of Transport to erect overhead tanks and an electric elevator. He estimated that the saving in filling carts from this would be a penny off the rates.

Mr. COLLINS (Norwich) said if small authorities went in for steam plant he thought it would pay for two or three of them to combine together, so that they would have workshops for repair.

Mr. HORTON (Derbyshire) said an authority could save thousands of pounds by running its own plant.

Mr. DENT (Essex), chairman of the Roads and Highways Advisory Committee of the County Councils' Association, said the general impression was that mechanical haulage had got to come, but they would do well to be a little cautious until they saw their way clearly.

IMPORTANCE OF COSTING IN ROAD WORK.

Mr. J. C. HALLER, county surveyor of Notts, submitted a paper on "Costing in Connection with Highway Construction and Maintenance." He said that with the exception of some of the large boroughs and counties there had not been, nor was there at the present time, any real attempt at putting that branch of the department on a proper and systematised footing. In the training of pupils who would ultimately become engineers and surveyors, no business education seemed to be thought necessary. Many young engineers who had taken up chief appointments had not the least idea of business methods or the value of pounds, shillings, and pence. When it was borne in mind that in one department alone of the local government engineers—the Highways Department—over fifty million pounds was expended annually in this country, it was surely necessary that the money should be spent not only in the best possible manner from an engineering point of view, but also from a commercial or business point of view.

Sir HY. MAYBURY said there was nothing so discouraging to engineers and surveyors, and so distracting to finance committees, as to find that the estimates had been exceeded without anyone knowing they were going to be exceeded. For that reason alone he suggested that it was important that even with the smallest authority as complete a system of costing should be kept as was possible. What they would do as directors of private companies they should do as custodians of the ratepayers' money.

OPTIMISM IN ROAD MAKING: SOME RESULTS.

Mr. W. J. HADFIELD, city surveyor of Sheffield, read a paper bearing the above title. He stated that in 1911 the Road Board offered help to highway authorities who were prepared to go ahead, and Sheffield, believing then, at is does now, that up-to-date roads were an economical proposition, was one of the first to benefit. The help thus received made it possible to commence a highway reform in this particular district which had never ceased, and was still progressing. It had not cost the ratepayers a penny—on the contrary, it had saved, and was saving, them every year many thousands of pounds. The financial results could be shown most effectively by the following table, which gave the actual cost of highway construction and maintenance over a considerable period, and included all expenditure, whether met by rate or by loan, or by grants from the Road Board or from the Ministry of Transport.

	£	Equal to Rate of
Total expenditure per mile of highway for five years ended March, 1910	251 ...	10·74d. in £.
Ditto ditto March, 1915	235 ...	9·91d. ,,
Ditto ditto March, 1920	152 ...	6·35d. ,,
Ditto for year ended March, 1921	229 ...	9·34d. ,,
Estimate for current year	268 ...	10·94d. ,,
Ditto, deducting subsidy from Ministry of Transport	221 ...	9·00d. ,,

The first period covered the time when motor traffic was becoming a serious factor, and the roads generally were maintained on the old lines. The second period covered a great deal of reconstruction work, which quickly made itself felt in the matter of maintenance costs. The third period included four years of war conditions during which heavy traffic greatly increased, and work was cut down to a minimum; also a year of reconstruction when a record figure of £358 per mile per annum was reached.

THE METHODS ADOPTED: IMPROVED MAINTENANCE.

The first factor in obtaining these results had undoubtedly been improved methods of maintenance, particularly the general adoption of tar-spraying and painting. This method was tried on a small scale in 1907 with the object of reducing the dust nuisance, but it was quickly recognised that the great advantage of tarring was that it prolonged the life of the roads. Sheffield did not get any grant whatever for surface tarring, yet over a million super yards were dealt with in this way every year because it was an economy. Since this method was generally adopted there had been a surprising decrease in the amount of macadam required for repairs, to say nothing of the mud which formerly had to be removed in the winter. Last year the writer went a step further, and tried a bituminous solution for surface painting. It cost a little more than tar, but had lasted better, and this year bitumen was being used in large quantities for surface work with excellent results. The only substantial objection to tar was its slipperiness, and bitumen apparently gives a better foothold for horses. Another factor which had greatly helped in the reduction of costs was the substitution of a

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more permanent material in the shape of tar macadam for the short-lived waterbound macadam. The term " permanent " applied to tar macadam was, of course, open to challenge, but to the writer's mind the description was fairly applicable to a material which has lasted for nine years on a road seven or eight yards wide, taking over 2,000 tons per day, inclusive of 90 to 100 motor omnibuses, and still remains in good condition. Not every method of laying tar macadam was successful. A good deal depended upon the method of laying, and of course the foundation must be satisfactory. Tarred material should have time to mature, especially if it is to be subjected to heavy traffic immediately after laying, and it was absolutely necessary, if omnibuses and similar vehicles were to be carried, to roll the road iron-hard.

The notion that it is sufficient to roll tar macadam moderately and leave the traffic to do the rest has proved fatal in many cases. Heavy rollers (12 tons for preference) and rolling till no further impression can be made are the best security for success with tar macadam. If the road won't stand this test, either the foundation must be weak or the material unsuitable. In the writer's experience it has rarely been necessary to pull up an old foundation before laying the new surface, though any obviously weak place is always strengthened. The old macadam crust often makes an excellent foundation.

There has been constant argument as to the respective merits of granite, slag, limestone, etc., for this kind of work. Granite is perhaps most useful in connection with tar macadam when used as chips after surface tarring. For the lower coat, slag, limestone, or clinker has been found quite satisfactory, and whenever there is a local stone which will take kindly to tar, it should be utilised for the lower coat on account of its cheapness. For the final coat slag is preferred.

In the year 1916, after seeing the excellent work done in this direction by Mr. E. J. Lovegrove at Hornsey, the Sheffield Council decided to lay a few experimental pieces of clinker-asphalte, i.e., a mixture of refuse-destructor clinker and mexphalte. In 1917 this material was used for a piece of road about 100 yards long and 10 yards wide, carrying an abnormal traffic. The traffic was abnormal as to individual weights. After four years' traffic this piece of road was still in first-class condition, and the length of its life could not yet be estimated. The asphalte was about two inches thick and was laid upon the old macadam. About the same time a small piece of similar surface was laid in a main artery 12 yards wide, carrying a normal daily traffic of about 4,000 tons per day in addition to about 1,200 tramcars. The traffic at the time this piece was laid was (on account of war conditions) about 50 per cent. heavier and included 500 motor lorries daily. Most vehicles pass along the margin (four yards wide), avoiding the busy tramway track. This piece was laid right up to the tramrail, with the idea not so much of finding out how long it would last as of seeing how soon it would be destroyed. This was in order to arrive at a basis upon which to calculate the life of such a surface in more favourable situations. The experimental patch was there to-day, and long lengths of the same material had since been laid in this particular road, for which a life of probably ten years was expected. Since the Armistice about 100,000 yards of asphaltic surface had been laid, of which about two-thirds was clinker-asphalte, mostly under very heavy traffic, and there was no sign of failure. Some of the best of this work was in streets where there are tramways. The asphalte was laid right up to the rails, the joint with the rails is practically perfect, and the writer knew no better way of minimising the inconvenience of rails in a busy thoroughfare.

Conclusions.

The experience gained in adapting a long mileage of average roads for modern traffic without undue cost to the ratepayer might be summed up as follows—

(1) A good waterbound road, six to eight yards wide, tar-sprayed or painted, is capable of carrying 400 to 600 tons per day of mixed traffic.

(2) For roads eight yards wide, carrying up to 2,500 tons per day, including 80 to 100 omnibuses, tar macadam on a sound foundation is an economical and satisfactory material .

(3) For roads with 3,000 to 4,000 tons per day, clinker-asphalte or a similar surface is sufficient.

Electric Vehicles for Municipal Purposes.

Mr. F. Ayton, chairman of the Electric Vehicle Committee of Great Britain, in a lengthy paper on the above subject, said that to local authorities who were now faced, as never before, with the insistent need for economy in every direction, the employment of electrics for their haulage services should specially appeal. In general, local authorities obtained loans for the purchase of motor transport vehicles, the Government department concerned requiring the loan to be repaid over a term of seven years. Prudence would indicate that anything purchased on such basis should comply with the following requirements—(*a*) Its assured useful life should be at least equal to the loan period, and this life should be obtained without abnormal cost for upkeep and repairs. (*b*) There should be some degree of certainty that, apart from the wages of those who operate it, the cost of working it and its efficiency will not greatly vary during its useful life. In regard to (*a*), the requirement, so far as present experience went, was met only in two types of vehicle, i.e., those driven by steam and electricity. The electric had an assured life, in ordinary usage, of at least ten years. There were in this country many electric vehicles running efficiently that were put into service at least seven years ago. In the United States, however, the electric was employed on a considerable scale several years before we made a start, and at the electrical exhibition held in New York in October, 1919, there were records of vehicles having up to 18 years' service.

As to condition (*b*), the electric vehicle drew its supply of power from the public electricity supply systems. Before very long the reduction in the cost of coal and in wages would cause present tariffs to be lowered. The great expansion which was taking place in the use of electrical energy for innumerable purposes would inevitably result in a further reduction in the cost to the consumer, so that in a few years it is quite likely that tariffs would be below the pre-war figures.

There were, however, other cogent reasons why municipalities should give preference to the electric. It was, for instance, clean and odourless, and in consequence did not detract from the amenities of the districts in which it operates. Upon the score of reliability the electric vehicle took first place. The *Contractors' Record*, reporting in December 1918, an interview with Mr. S. T. Allen, borough electrical engineer of Wolverhampton, quoted him as saying, " I have found electric vehicles to have a reliability equal to something like 95 per cent. of the working hours due to the simple mechanism, and in consequence, of course, the upkeep charges are low." On this point also the experience of Mr. A. W. Blake, in connection with the electrics belonging to Willesden District Council, might be cited. In a recent statement he said that of the fourteen electric vehicles which were operating on house refuse collection in the district, one had run without any loss of time whatever throughout the twelve months, one lost half an hour, one lost one hour, one two hours, and one two and a half hours ; and, taking the whole fourteen vehicles, the whole time lost was only ninety-nine and a half vehicle hours, which represented only 0·3 per cent. of the whole working time. Another feature which rendered the electric vehicle more dependable than the petrol vehicle was that it was not affected by weather conditions to anything like the same extent. It was as easy to start in extreme cold as it was in warm weather. The most important advantage which the electric possessed in comparison with other methods of haulage laid, of course, in its low overall cost of operation, and this in spite of the fact that its initial cost was generally higher than that of other types. The mistake of thinking that a vehicle which was low in first cost would give the most economical results was well exemplified in the case of the Urban Council of Pontypridd. Mr. W. E. Lowe, the Council engineer and surveyor, had supplied figures showing the results of refuse collection in his district by (*a*) electric 2-ton vans, and (*b*) Ford 1-ton vans. The cost per ton collected by method (*a*) was 6s. 5¼d. and by method (*b*) 8s. 3½d. The total expense incurred for petrol repairs, renewals, and cleaning in connection with the Ford vans exceeded the expense concerned with electric power, repairs, renewals, and cleaning in the case of the electric vans by 4½d. per ton collected—a difference of 18 per cent. In an appendix to the paper were quoted some opinions expressed by municipal engineers which went to support the claim as to the high economy of the electric. The author also quoted the testimony of the Midland Railway Company and several brewery managers. The simplicity of the electric was another valuable feature possessed by no other type. In consequence the vehicle was so easy to drive and control that any person of normal intelligence could be taught in a few hours to become a reasonably competent driver. This simplicity had an important bearing on the repair bill, and it also accounted for the long life of the chassis. In this connection the opinion expressed by the chief goods manager of the Midland Railway.

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Mr. H. Evans, was of interest. He stated—"Electrics are not so intricate and delicate, nor so liable to go wrong owing to inexpert handling, or the rough usage involved in dealing with miscellaneous merchandise and working into and out of all sorts of gateways, yards, passages, etc." Credit must be accorded to municipal engineers and cleansing superintendents for being amongst the first to recognise the advantages possessed by the modern type of electric for such services as those for which it had proved to be so eminently suitable. The municipalities had adopted them with a single eye to obtaining greater economy and efficiency in the particular haulage services. Municipalities owned and operated a total of 413 electric vehicles. In the United States the total number of electrics in use for all purposes was enormously greater than here, but comparatively very few were employed in municipal service. The majority of the municipally owned electric vehicles were employed in the collection of refuse. Mr. J. A. Priestley, the Sheffield superintendent of cleansing, once remarked that "the history of the progress of electric vehicles in this country is very largely the history of their use in cleansing work." This was true; it was also true to say that this class of work was about the most testing to which any mechanically-propelled vehicle could be put, since it meant constant starting and stopping. The electric had proved to be the most suitable type for this work, but the opinion was held by some that for journeys up to about three miles in total length from the place of disposal and back thereto there was still an advantage in horse haulage. Beyond this distance motor haulage, and electric in particular, unquestionably held the field. One well-known cleansing superintendent expressed the opinion that the electric is cheaper than horses for any distance. It was obvious, however, that the economic mileage varies in every town according to its peculiar conditions, and in consequence there could be no rigid standard.

In refuse collection, as in other classes of work, the cardinal requirements for obtaining satisfactory results from the employment of the electric were moderately good road surfaces and the proper utilisation of the vehicle as a labour-saving machine.

The general haulage service of a borough engineer's department was a class of work in which the electric showed advantages and economies over other methods; this claim was supported by the very satisfactory results obtained by the Ipswich Corporation and others. Electric vehicles were employed for street watering and gulley emptying in several towns, notably Blackpool, Bootle, and Ipswich. Several municipal tramways departments used electric tower wagons with entirely satisfactory results. The advantages of a vehicle which could be instantly started from the depot upon receipt of an emergency call, and without the difficulties of engine-starting in cold weather, were manifest. As the driving was so simple several employees could easily be taught how to drive it, so that a driver could always be quickly obtained. The fire risks inherent in a petrol-driven vehicle were absent in the case of an electric—a valuable feature in a car-shed. The haulage of coal and ashes in connection with municipal electricity departments was another sphere in which the electric vehicle had been the means of reducing expenses. It was employed for this purpose at Aberdeen, Bradford, Burton-on-Trent, Croydon, Derby, Gillingham, Glasgow, Kettering, Leeds, Maidstone, Norwich, and Sunderland. Electric omnibuses were in use at Derby, Lancaster, South Shields, and York. While such vehicles have, in regard to working expenses, proved highly economical, they were, in his opinion, lacking in sufficient speed. He held the view, however, that it was only a question of a short time before it would be possible to place upon the market electric (battery) omnibuses much more speedy than those now running. The author also predicted a promising future for railless trolley cars, and looked forward to seeing combined passenger and freight-carrying services established and run by such vehicles operating from trolley-wires between important towns. Given good roads and the necessary capital, such services could be put into operation to-day, and with electrical energy at not more than 1½d. per unit, and a sufficient volume of traffic, they would prove financially successful. He had refrained from giving estimates of working cost in connection with electric vehicles because he knew how misleading such estimates could be, for conditions varied so greatly in different towns. It was a type which had its limits, but these were mainly centred in the mileage capacity of the battery. With every improvement in batteries its sphere of utility would extend. When exchange of batteries could be arranged the daily mileage was, of course, limited only by the speed of the vehicle and the character of the work being done.

ROAD TRANSPORT SHOW.

We give below a short description of some of the principal motor vehicle exhibits at the Public Works, Roads and Transport Congress and Exhibition held at the Agricultural Hall, Islington, from November 17 to 25. An account of certain of the general exhibits is given elsewhere in this issue.

Stevens Petrol-Electric Vehicles, Limited, of 68, Victoria Street, S.W.1, devoted their stand to a specimen of their "War Office subsidy" A type chassis, designed for a gross load of four tons. The fact that this chassis fully conforms to the requirements of the War Office, by whom it has been largely used both at home and overseas, is not an inconsiderable tribute to its reliability. The place of the gear box and clutch is, of course, taken by an electric transmission of great flexibility, which reduces the maximum driving strains between the engine and the rear axle by something like 50 per cent. The electrical equipment may also be profitably used for supplying current for searchlights, lighting systems, arc-welding, electric heating and battery charging.

Electricars, Limited, of 47, Seymour Place, W.1, presented a couple of vehicles which attracted well merited notice. One was the latest improved type of Edison accumulator municipal tipping wagon, of 50 cwts. carrying capacity. The tipping gear, which is of the electrically-operated, "self-stopping" type, allows the body to empty or right itself in 20 seconds. The rear road wheels are driven from twin motors, with independent action, installed on the outside of the chassis frame—a fact which, like several other features, affords great accessibility. The Edison battery of 60 type A-8 cells is housed underneath the bonnet in front of the dashboard and below the driver's seat. The controller box is also readily approachable, situated as it is on the near side of the chassis frame, behind the front mudguard. The other vehicle had a similar chassis, but the body was a 750-gallon watering wagon (3¾ ton), interchangeable with a dust-collecting body, as supplied to the Borough of Islington.

Fodens, Limited, of Sandbach, Cheshire, staged one of their standard type wagons, 13 ft. by 6 ft. 6 in. by a depth of 1 ft. 6 in., and having hinged sides, and a hydraulic tipping wagon with a box body 10 ft. by 6 ft. 6 in. by a depth of 3 ft. Both vehicles were on the widely-known Foden lines, having locomotive boilers, compound engines and chain transmission. A useful provision was that of the double high pressure gear, by means of which the low pressure engine may be converted to high pressure (with separate exhaust), immediately, when required. The cast steel road wheels are fitted with solid rubber tyres.

Another stand which occupied an appreciable part of the main hall was that of the Agricultural and General Engineers, Limited, of Central House, Kingsway, W.C., and their branch companies. Of the latter, Richard Garrett and Sons, of Leiston, exhibited a 5-ton non-superheated wagon on rubber tyres, with a hand and mechanically-operated tipping gear and a 2½-ton electric vehicle with an end-tipping body. Charles Burrell and Sons, of Thetford, had on view a 5-H.P. special road locomotive, equipped with double crank compound cylinders and having a winding drum for wire rope. Barford and Perkins, of Peterborough, staged a type "J" motor road roller of 10-12 tons weight and 30-35 H.P.; a 3-wheel water ballast motor road roller of similar weight and 35-40 H.P., and a Thackray-Barford patent road scarifier. Aveling and Porter, of Rochester, displayed a tandem type steam roller of 5 tons, having a quick reverse; a 10-ton steam roller; a steam tractor on rubber tyres, to haul 10-12 tons, and a "Price" patent resilient scarifier. A light railway tip wagon was shown by J. and F. Howard, Ltd.

The Laffly (England) Company, of 14, Addison Avenue, W.11, had a very comprehensive display of their road vehicles. These comprised the 5-ton dust refuse collecting wagon; 7-ton petrol roller (which was described in our issue of November 17); a watering wagon that can also be used as a fire engine; a motor road sweeping machine; the Laffly-Schneider Autobus of the type which recently toured Great Britain, and an engine and gear box manufactured under the same name.

Carrosserie Latymer, Limited, of Walmer Road, W.10, exhibited a 4-ton all-steel Carrimore patent sides and end tipping trailer and a standard all-steel Carrimore trailer chassis of the same weight. The former is notable for the ease with which it can be tipped in three directions by means of a universally-jointed central shaft.

The "Sentinel" Wagon Works (1920), Limited, of Grosvenor Gardens, S.W.1, showed a 6-ton chassis with a standard platform body and a 5-ton end-tipper. Each can, if necessary, take a trailer.

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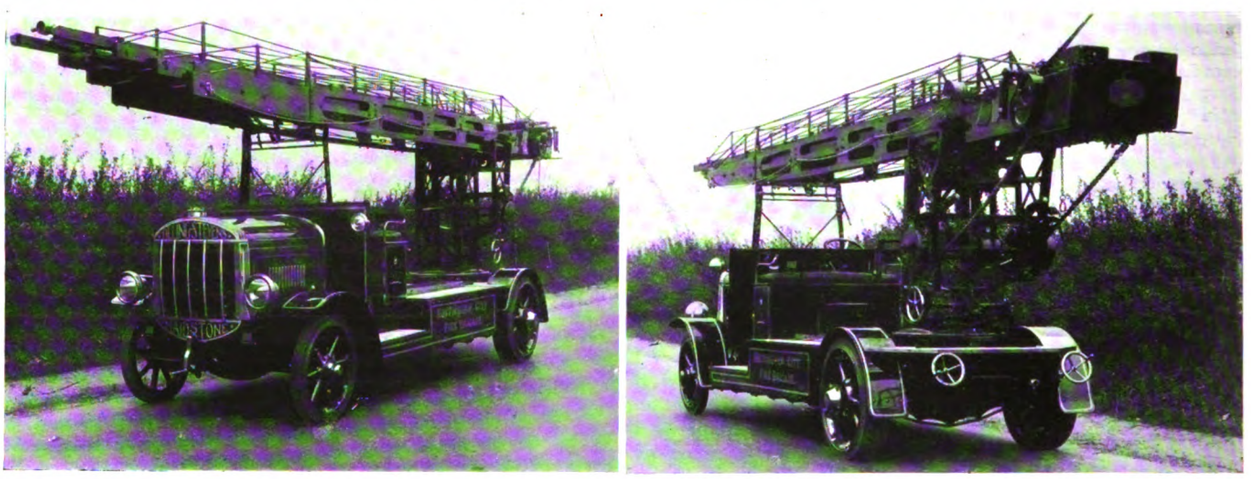
The stand of the General Vehicle Company, Limited, of 43 Shoe Lane, E.C.4, contained three vehicles. These included a 2-ton electric chassis, fitted with a street watering tank, interchangeable with an end-tipping body; a 3½-ton chassis carrying a "Craymer" unloader; and also a 5-ton chassis with a 3-way tipping body.

TILLING-STEVENS' FIRE APPLIANCES.

Messrs. Tilling-Stevens Motors, Limited, of Maidstone, have just delivered an 85-ft. motor turntable ladder to the Nottingham City Fire Brigade. The ladder is mounted on one of the firm's well-known T.S.4 type petrol-electric chassis, which has a 4-cylinder engine of 5 in. bore × 6 in. stroke.

While readers are no doubt familiar with the underlying principle of the petrol-electric, it may not be generally known that the electric current generated by the dynamo can be used for auxiliary purposes. Such is the case with this vehicle, for the power is utilised for driving the 3-H.P. electric motor which raises the ladder. This motor is made thoroughly waterproof, thus obviating any possibility of the motor failing at the critical moment. The ladder itself consists of four separate sections, one main and three sliding, each provided with a safety catch. These can be extended to a length of 85 ft. The maximum angle of elevation is 78 degrees, and when the ladder is fully extended at this angle it will carry a man at the top with perfect safety without leaning against any building. In fact, the ladder has been tested in this position carrying three men of a total weight of 36 stone. A small dial is fitted at the base showing the number of feet the ladder has been extended. The whole turntable can be easily turned by hand, as the base is mounted on steel balls. It is interesting to note that early this year Messrs. Tilling-Stevens supplied the Newcastle Corporation with a similar ladder, which is giving every satisfaction. The London County Council also use petrol-electric vehicles for mounting turntable fire ladders.



Motor Fire Escape Manufactured by Tilling-Stevens, Limited.

EDINBURGH MUNICIPAL GARAGE.

In order to effect economies in the use and running of the motor cars owned by the Corporation of Edinburgh, a pooling system has been in operation during the past six months. Mr. Pilcher, the tramway manager, under whose supervision the cars were placed, has issued a report showing that five landaulettes and four open cars comprise the Corporation fleet. The vehicles covered 60,500 miles during the period under review, while there were 573 taxi-cab hires costing £536. The cost of running the cars, including capital charges, is 12·072d. per mile. The charges which have been made to the different departments have been at the rate of 1s. 3d. per mile, plus 3s. per hour, and this has resulted in a book profit of £1,022 up to date. Mr. Pilcher suggests that the rate be reduced from 1s. 3d. per mile to 1s. per mile. While it would not be economical to have sufficient cars to meet all the calls, it would be economical, he says, to have an additional landaulette, which would mean a considerable reduction in the hiring account. The bill for horse cabs amounted to £107.

PROFITABLE OMNIBUS OPERATION.

ANNUAL MEETING OF THE EASTERN COUNTIES COMPANY.

The Eastern Counties Road Car Company's third annual meeting was held on November 10 at Ipswich, Mr. W. Wolsey presiding. The report and accounts for the year ended September 30 last showed net receipts and other revenues totalling £16,177, before providing for Corporation profit tax and after providing for renewals. After deducting administration and general expenses there remained a surplus of £8,980 14s. The balance brought forward after providing for excess profits duty and Corporation profits tax was £3,552 13s., making a total of £12,533 8s., which the directors proposed to appropriate as follows—To reserve account, £500; to dividend on the ordinary shares at the rate of 10 per cent. per annum, £8,578 13s. 10d.; to be carried forward, £3,454 14s. 4d. The report added that the year's operations had been satisfactory, in spite of serious trade depression. Exceptionally fine weather, and record holiday traffic had largely contributed to the result, but the regular services of the company continue also to expand. The company now operates 21 services, compared with 16 last year, and the route mileage had increased from 232 to 305.

The Chairman, in moving the adoption of the report, referred to the very satisfactory results of the year's work, and said that no doubt the exceptional weather counteracted to a great extent the adverse influence due to the coal strike and unemployment. A cause for congratulation in the future would be the impending completion of the new workshops at Ipswich, which would be the means of effecting considerable economies in maintenance and repairs. The sum paid under the new motor taxation was £2,062, all of which was to go to road maintenance. This was a heavy contribution to make. During the year there had been a considerable fall all round in prices, especially in the price of petrol, and although the outlook for trade in the district was temporarily very black, it was hoped that the lower working expenses which would be possible consequent upon these reductions would enable the company to maintain their position. The public had gained something also, for fares which were increased at the end of the summer of 1920 had been in some cases reduced. The chairman also alluded to the good relations existing with the employees, who in order to allow as many men as possible to be kept on during the winter had agreed to accept certain reductions in pay and changes in hours of employment. The directors and management had received many useful suggestions from time to time from the employees. In conclusion, the chairman referred to the injustice of competition from any sort of vehicle running to no fixed timetable on the best days of the week, while the company had to provide high-class omnibuses operated to fixed times. If such competition were allowed the public must suffer in the end. In the category to which he had referred he did not include the old-established country carrier, who had substituted mechanical for horse traction and ran regularly on definite days.

The motion was adopted, and Messrs. R. M. Tilling, F. L. Bland, and J. A. Grant, M.P., were re-elected directors. The meeting increased a director's remuneration from £50 to £100 per annum, and that of the chairman from £100 to £200.

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MOTOR TRAFFIC

MOTOR VEHICLES FOR MUNICIPALITIES.

SHEFFIELD HOSPITALS COMMITTEE have authorised the purchase of a car.

LYTHAM COUNCIL have obtained consent to borrow £875 for the purchase of a lorry.

THE METROPOLITAN ASYLUMS BOARD have purchased a motor van at a cost of £254 15s. Further omnibuses are to be purchased.

GLASGOW WATCH COMMITTEE have had six tenders for the supply of two motor fire pumps, and referred them to the firewriter for tabulation and report.

HARROGATE'S borough engineer recommends the purchase of a 5-6 ton electric tipping wagon, at £1,250, for the cartage of fuel to the electricity works.

JOHANNESBURG MUNICIPAL COUNCIL have arranged to purchase a motor cycle for £90 for an official, who will repay the cost out of his travelling allowance.

WOLVERHAMPTON CLEANSING COMMITTEE report that three electric vehicles are now in use for the collection of refuse. The vehicles are doing excellent service.

WALSALL WATCH COMMITTEE have decided to get revised tenders for the supply of a motor fire engine and escape combined for consideration at a meeting in March next.

THE METROPOLITAN BOROUGHS standing committee are convening a conference of local authorities in order to secure the co-ordination of the ambulance services of London.

ROTHERHAM WATCH COMMITTEE have deferred till the end of the financial year a proposal to purchase a motor chassis to take the body of the present horsed ambulance.

ROTHERHAM TRAMWAYS COMMITTEE recommend acceptance of the tender of Messrs. Clough, Smith and Company, amounting to £978, for the supply of a railless chassis and motor.

SALISBURY, SOUTHERN RHODESIA.—The surveyor expresses the opinion that the time has arrived for the Corporation seriously to consider the adoption of mechanically-propelled vehicles for street watering.

THE MINISTRY OF TRANSPORT have sanctioned a grant to the York Council of one-third of the cost of a new Foden wagon and trailer for use on street work, as the plant will reduce the hiring charges of transport.

NEWPORT CLEANSING COMMITTEE have decided to purchase a 1-ton motor lorry at a cost of about £250. This vehicle can be also used for collecting small lots of trade refuse now extravagantly done by one of the 3-ton electric vehicles.

DURHAM COUNTY COUNCIL have authorised the county surveyor and the director of agriculture to purchase a British-made car at a cost not exceeding £650. The county surveyor advises that the road foremen be allowed 25s. per week towards the cost of purchasing and running motor cycles.

LEEDS WATCH COMMITTEE have accepted the tender, £2,269, of Leyland Motors, Limited, for the supply of an 85-H.P. motor fire engine, and also decided to purchase from the firm a fire escape at an approximate cost of £400. The electricity committee are to purchase a car for their superintendent at a cost of £350.

BRISTOL CORPORATION have decided to purchase a motor vehicle for use by people journeying to the sanatorium. A charge is to be made for its use by patients and their visiting relatives and friends, and for other necessary sanatorium purposes. Accounts will be kept, so that the experiment can be discontinued if not remunerative.

HERTFORDSHIRE COUNTY COUNCIL provide motor cars to enable police superintendents to carry out their duties efficiently. At present five cars are in use, but the allowance made to the superintendents is not sufficient to allow of the payment by them of the annual Road Fund licences. In the circumstances the Council propose to pay the licence fees, which total £83.

LIFE OF TYRES AND TUBES.—The Motor Transport Department of the Admiralty collect particulars of any tyres and tubes condemned after a working life of less than that shown in the following table—Solid tyres 10,000 miles; pneumatic tyres (rear) 3,000 miles; pneumatics (front) 5,000 miles; inner tubes 3,000 miles. Contractors replace free of charge any solid tyre, the rubber portion or the steel band of which may burst or fracture when being pressed on or off the wheel, provided a certificate is given that the pressure used did not exceed 30 tons in the case of a front wheel or 40 tons in the case of a rear wheel.

OMNIBUS SERVICES.

CARDIFF.—The Tramways Committee have directed the general manager to experiment further with the running of motor omnibuses. During a working of nine months there was a loss of £2,746. The period was notable for costs being at their highest and for trade depression. The Watch Committee have withdrawn all temporary permits issued to private omnibuses and coaches during the period of restricted tramway service due to the coal strike.

DONCASTER.—The Corporation have decided to promote a Bill next session for power to run omnibus services from Warmsworth tramway terminus to New Edlington, to Edlington New Village, from Woodlands to Bentley tramway terminus, from Doncaster to Bawtry and Ressington, from Doncaster to Stainforth and Hatfield, and from Doncaster to Conisborough. The Council have given permission to Doncaster Motor Omnibuses, Limited, to operate on some of the above routes until March, 1922, on condition that the vehicles are not run in competition with the tramway services.

DURHAM.—The county surveyor has reported that the Seaton Carew-Port Clarence road has been practically destroyed by three competitive omnibus services. Heavy expenditure will be necesssry to reconstruct the road.

HULL.—The Corporation Tramways Committee have reduced the full fare on the Stoneferry omnibus service from 4d. to 3d., and have extended the 2d. stage. This route has been showing a loss equivalent to £870 a year.

KENT.—The annual report of the Kent county surveyor mentions that omnibus traffic has vastly increased, and services are now run on 378 out of 604 miles of directly maintained roads. Motor coach traffic is also very extensive. The cost of maintenance per mile is £378. In the northern part of the county the roads carry what is nothing less than Metropolitan manufacturing traffic, and the London coach traffic traverses all the roads to the coast.

LINCOLNSHIRE.—A transport company has notified the local authorities of proposed omnibus services from Grantham to Bourne, Bottesford, Sleaford, Newark, Melton, and to Stamford.

NEWPORT.—At the Tramways Committee of Newport Corporation a letter was received from the South Wales Commercial Motors, Limited, stating that the company had no wish to deprive the tramways of any fare that would reasonably belong to them, and that for all passengers carried by the Newport-Chepstow omnibus service, within the borough area only, they would be prepared to hand the equivalent of the tramway fare to the Tramways Committee. The committee decided that their previous decision be adhered to, that the chairman be authorised to continue his negotiations with the Ministry of Transport, and, if he deems necessary, to communicate with Members of Parliament thereon; and to inform the company that no useful purpose would be served by an interview.

SHEFFIELD.—The net profit on the Corporation motor omnibus department for the past three months has been £2,794.

WALSALL.—In view of the greatly increased licence duties placed upon motor omnibuses under the Finance Act, 1920, and the increasing liability of operators to competition from persons making no contribution towards the reconstruction or the maintenance of roads other than the licence duties on their vehicles, the Tramways Committee consider it is inequitable that they should continue to be liable for the statutory contribution in respect of road adaptation. The committee have communicated with the Ministry of Transport and the Association of Municipal Corporations with a view to the termination of the liability. The committee have authorised the payment of 50 per cent. on account of road adaptation by adjoining authorities, and have requested those authorities to allow the matter of the balance to stand over until the result of the communication to the Ministry is known.

WORCESTER.—On account of congestion the Corporation have agreed to widen Little Angel Street to 64 feet, the present width being 32 ft. This thoroughfare is a terminus for the numerous omnibuses from a wide district around Worcester. The streets committee have been instructed to consider the cost of adding a piece of land to Little Angel Street for the purpose of a siding. Consideration is being given to the question of providing stands for the vehicles of the Birmingham and Midland Omnibus Company, and to charge a rent.

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MOTOR TRAFFIC

MOTOR TRAFFIC NOTES.

REGISTRATIONS IN LIVERPOOL.—In 1914 the number of motor vehicles registered in Liverpool was 1,410. It is at present 6,000, including 2,813 lorries.

LONG DISTANCE TOURING.—On October 23 the T. and S. Tourist Company, of Chicago, started four 10-passenger omnibuses and a fleet of private cars on a trip to New Orleans, a distance of 1,136 miles.

TRAFFIC REGULATION IN PARIS.—In order to alleviate traffic congestion in Paris it is proposed to prohibit horse vehicles using the busiest streets during certain hours, and to increase the number of streets in which traffic is confined to one way.

SURVEYING FROM THE AIR.—The Ministry of Transport gave instructions for a survey from an aeroplane of the proposed route of the road from Romford to Southend. Approximately 180 photographs were to be taken, giving a continuous view of the 21 miles of the route.

THE GERMAN MOTOR TRADE.—A Berlin newspaper states that the motor manufacturers in Germany have sufficient orders to keep them busy for six months, and that the leading firms refuse to bind themselves to conditions of delivery or price, while binding the customer to his order.

THE THREATENED U.S. RAIL STRIKE.—In the event of the strike of U.S.A. railroad employees, the authorities of New York had made preparations to use the city's 57,000 motor lorries to carry the daily quota of 1,500 loads of foodstuffs. The supplies in cold storage would have lasted three weeks.

NOISY TRAFFIC AT NIGHT.—Having had representations as to the disturbance and annoyance of residents by the use of horns or other noisy instruments, or loud singing or outcry by excursionists at night, the Hampshire County Council have drafted a by-law dealing with the nuisance "between sunset and sunrise."

A 40-h.p. 4-ton Bristol Lorry—A Repeat Order from the British Petroleum Company, Limited.

ROAD CONSTRUCTION IN CANADA.—Twenty million dollars are to be expended within the next five years in the development of highways and market roads in the provinces of Manitoba, Saskatchewan, and Alberta. Of all the agencies which have been behind the good roads propaganda, the motor organisations have been the most active.

WEIGHBRIDGE BROKEN BY EXCESSIVE WEIGHT.—Glasgow Corporation are claiming £55 from the owner of a steam lorry, as the cost of repairing a weighbridge, which was restricted to loaded vehicles weighing up to 12 tons. It is alleged that this lorry weighed over 16 tons. A further claim is for compensation for revenue lost whilst the weighbridge was out of action.

FRENCH MOTOR REGISTRATIONS.—A report issued by the French Government shows that last year there were 236,148 motor vehicles registered in France. The total is made up as follows—Privately-owned lorries 72,649; public service passenger-carrying vehicles 21,036; public service lorries 6,418; vehicles subventioned by the State 777; privately-owned cars 135,266.

SHOPPING TRIPS BY ROAD.—In consequence of the success of their coach excursions to London in October, Messrs. Gamage, Limited, repeated the innovation in November during a sale. Passengers were carried at single fares from Aldershot, Arundel, Bedford, Brighton, Eastbourne, Deal, Hastings, Gravesend, Hertford, Margate, Oxford, Newbury, Portsmouth, Reading, Southampton, Winchester, and Windsor.

OMNIBUSES USED IN A RAILWAY BREAKDOWN.—Owing to a complete block of the lines at the North Road Station, Durham, at 8 p.m. on November 8, due to a collision, traffic had to be suspended. With great promptitude, Mr. W. Parker, the station master, requisitioned a number of N.E. Railway omnibuses, and in a short time the stranded passengers were on the way to their destinations in various parts of the county.

PRICE OF PETROL IN THE U.S.A.—In October the average wholesale price of gasoline in the 30 largest cities of the United States was approximately 20·4 cents. a gallon, as compared with 29·3 cents a gallon on January 1. This is a decline of 8·9 cents, or 30 per cent. A decline of 13 cents since the first of the year was shown in Dallas and Denver, while the price has fallen off 12 cents in Tulsa, Okla. The price was highest in Boston, where it was 26 cents a gallon.

PICKFORDS' TOURS IN 1921.—During the past season the motor coaches of Pickfords, Limited, traversed 70,000 miles on long distance British tours and carried large numbers of tourists to the battlefields from Paris and to the beauty spots of Switzerland from Berne. More coaches are to be employed in the Continental tours next year. To avoid the heavy duty on imported vehicles the firm purchase French chassis and fit them with British bodies. French drivers and English conductors are employed.

THE HOME SERVICE AMBULANCE MOVEMENT.—The Home Service Ambulances of the British Red Cross Society and Order of St. John carried 13,230 patients during the September quarter of this year. This ambulance service, which forms part of the peace work of the Joint Council, was established two years ago, and comprises over 300 motor ambulances stationed mostly in rural areas in England, Ireland, and Wales. The total number of cases carried in the ambulances since the institution of the service is 75,022.

LIABILITY FOR PREMATURE STARTING OF OMNIBUS.—At Southwark County Court, Frederick Storking was awarded £100 damages against the London General Omnibus Company for injuries sustained by the premature starting of an omnibus. While plaintiff was alighting, the conductor, who was collecting fares inside, pulled the bell, and Storking was thrown on to the road. Commenting on the opinion of counsel for the defence that passengers had no right to descend the stairs of an omnibus until it had stopped, Judge Sir Thomas Granger admitted that he, an elderly man, did not observe any such rule. It was a common practice for people to alight from omnibuses while they were in motion, and it was probable that conductors started them before they should.

"A.E.C." LITERATURE.

AN IMPOSING ASSORTMENT.

In these days, when intensive publicity is regarded as a vital part of business organisation, the advertising or "literary department" of any reputable firm naturally occupies an important place. That of the Associated Equipment Company, Limited, of Walthamstow, has evidently assumed extensive proportions, and is capable of turning out excellent work. The complete range of the firm's latest catalogues, booklets, and posters, setting forth the well-known qualities of their motor vehicles, comprises over a dozen separate productions. Each of the booklets is most tastefully printed and bound; the diagrams and half-tone illustrations are sharp, clear, and effective, while the reading matter is well indexed and terse. The stout linen-faced covers are mostly in quiet and dignified tones of brown or orange and black, the edges secured with cord or ribbon to match.

The posters are also generally assertive and artistic, though the matter of colour combinations might be watched a little more closely. Certainly the company set up a standard in pubicity material which warrants emulation. The productions beforle us deal with the following specimens of the Associated Equipment Company's products—commercial motor vehicles, passengers and goods; the 30 H.P., 3-type engine; 35 H.P., 4-type engine; 45 H.P., 5-type engine; 4-speed spur gear box for model 4 chassis; A.E.C. horse-box, with horse-box trailer; underslung worm-driven rear axle for model 4 chassis, and overhead worm-driven rear axle for model 5 chassis; specification of A.E.C. limousine coach on special model 4 chassis; specification of standard 26-seater motor coach de luxe; specification of 40 passenger, model 402 single-deck omnibus. The firm's slogan, "Builders of London's 'buses," is kept well to the fore on all the covers.

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THE TRAMWAY AND RAILWAY WORLD
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ILLUSTRATED

A REVIEW OF PROGRESS IN *Electric* AND OTHER *Traction.*

CAMMELL LAIRD & Co., Ltd.,
SHEFFIELD.

HIGH SPEED STEEL FOR TURNING HARD TYRES
"CAMEL" BRAND TYRES FOR LONG MILEAGE
LONDON — 3 CENTRAL BUILDINGS, WESTMINSTER, S.W.1.

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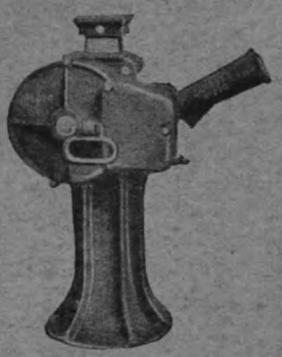
Genuine Barrett Jacks

are really a sound Engineering Job. 97 different sizes actually stocked in London, Liverpool and Newcastle, ranging in capacity from 1 Ton to 75 Tons.

Ball Bearing Journal Jacks

Jack No.	Capacity in Tons	Height Inches	Raise Inches
159	25	9	3¼
259	25	11	5¼
53	15	9¾	4
52	15	11	5

Geared Automatic Lowering Jack



Jack No.	Capacity in Tons	Height Inches	Raise Inches
230	35	28	17
29	25	28	17

Duff Genuine Barrett Automatic Lowering Jack No. 2

THIS jack is extensively used by contractors, truckmen, industrial concerns, street railway companies, and others requiring a jack suitable for all general lifting purposes. It has no equal in strength, safety, ease in operation, light weight, and moderate cost. Being double acting, the load is moved up or down half a notch on both the upward and downward strokes of the lever. The direction is determined by an eccentric at the side of the frame. The load is lowered gradually, and cannot be suddenly dropped as with a trip jack. This jack can be operated at any angle.

Jack No.	Capacity in Tons	Height Inches	Raise Inches	Size of Bar Inches	Weight with Lever
2	10	21	10	1⅜ × 1⅜	73 lbs.

Motor Lorry Jacks

Jack No.	Capacity in Tons	Height Inches	Raise Inches
100	3	10¾	5¼
200	3	13	6¾

We can give immediate deliveries from Stock

Genuine Barrett Jacks are made from High Carbon Steel, refined Malleable Iron and Drop Forgings

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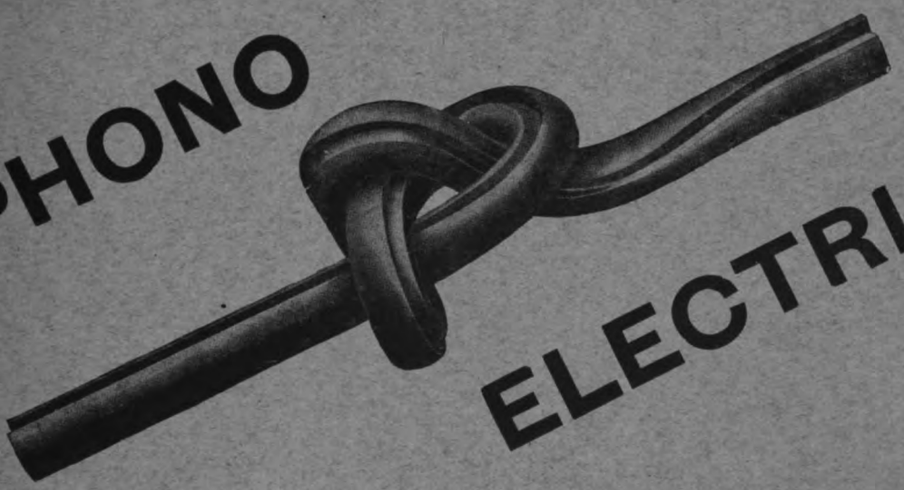

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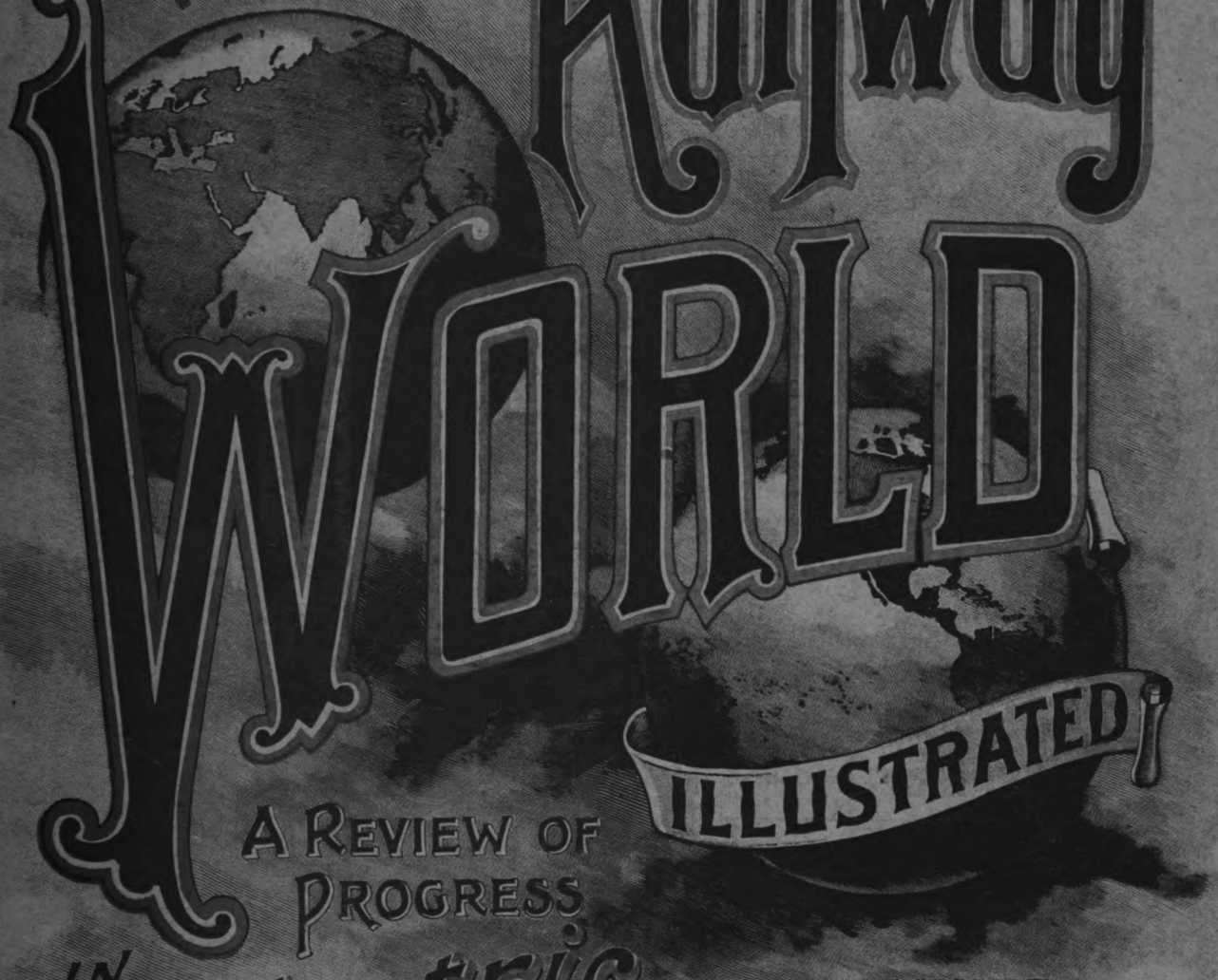

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"CAMEL" BRAND TYRES FOR LONG MILEAGE
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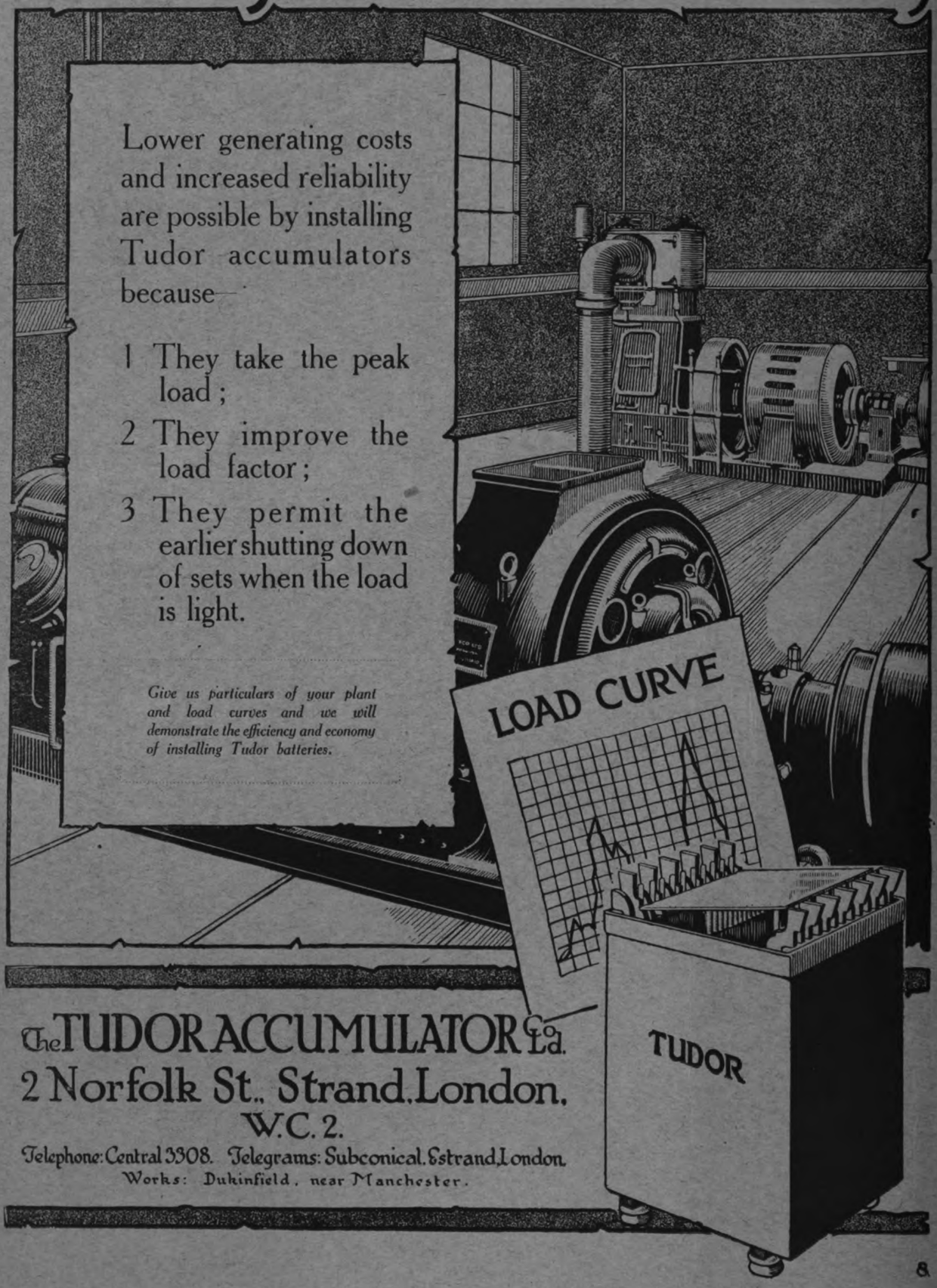
Generating costs & increased reliability



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1 They take the peak load;

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3 They permit the earlier shutting down of sets when the load is light.

Give us particulars of your plant and load curves and we will demonstrate the efficiency and economy of installing Tudor batteries.

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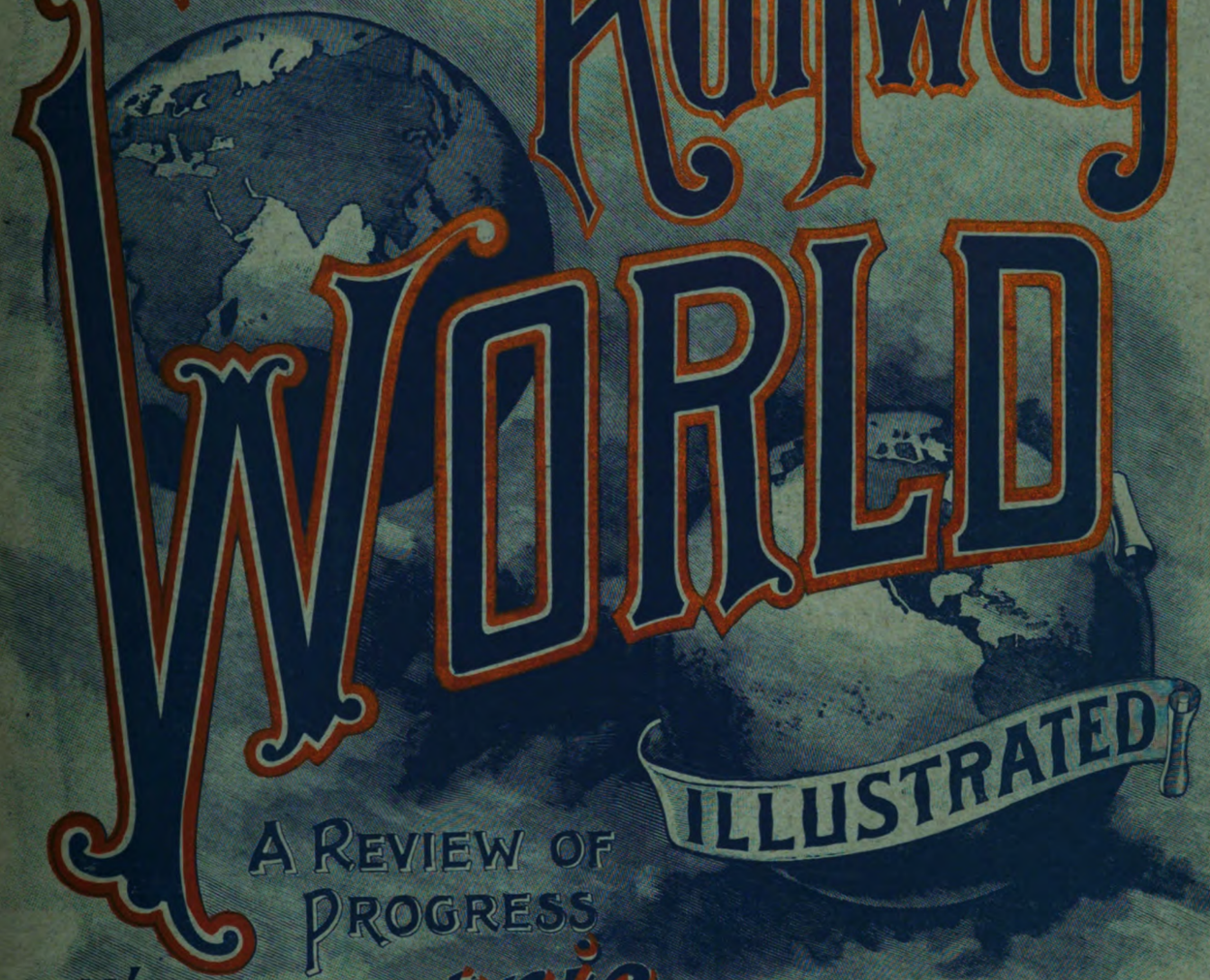

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TYRES AND AXLES

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"CAMEL" BRAND TYRES FOR LONG MILEAGE
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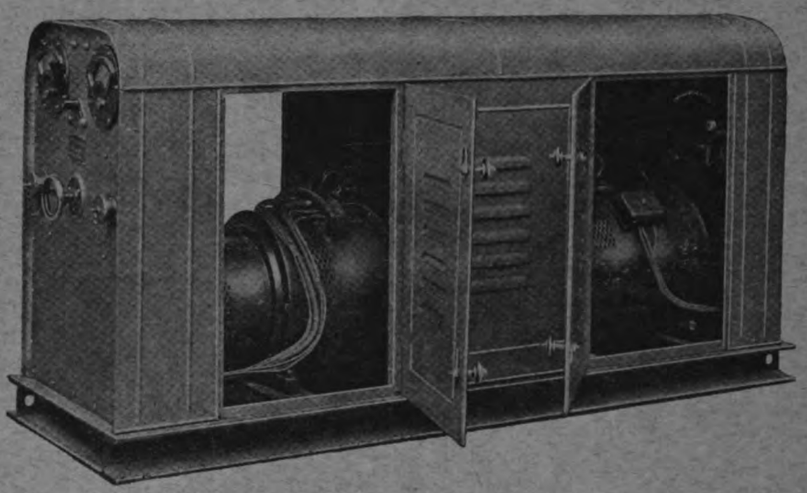
Instal A.W.P. Welding Plants



THE following emphatic evidence was given by two well-known tramway engineer managers before the Tramways and Light Railways Association at their recent Congress.

(1) "I have practised electric welding on my tramways for 10 to 11 years and it is a mystery to me how in these hard times any tramway manager can get on without electric welding. Electric welding has been adopted in every department of the system and there is hardly any part of a tramway equipment that could not be electrically welded with more or less success."

(2) "I have been using an electric welding plant for upwards of 12 years and I do not think any undertaking of a reasonable size is really complete without one."

These are the opinions of experienced men.

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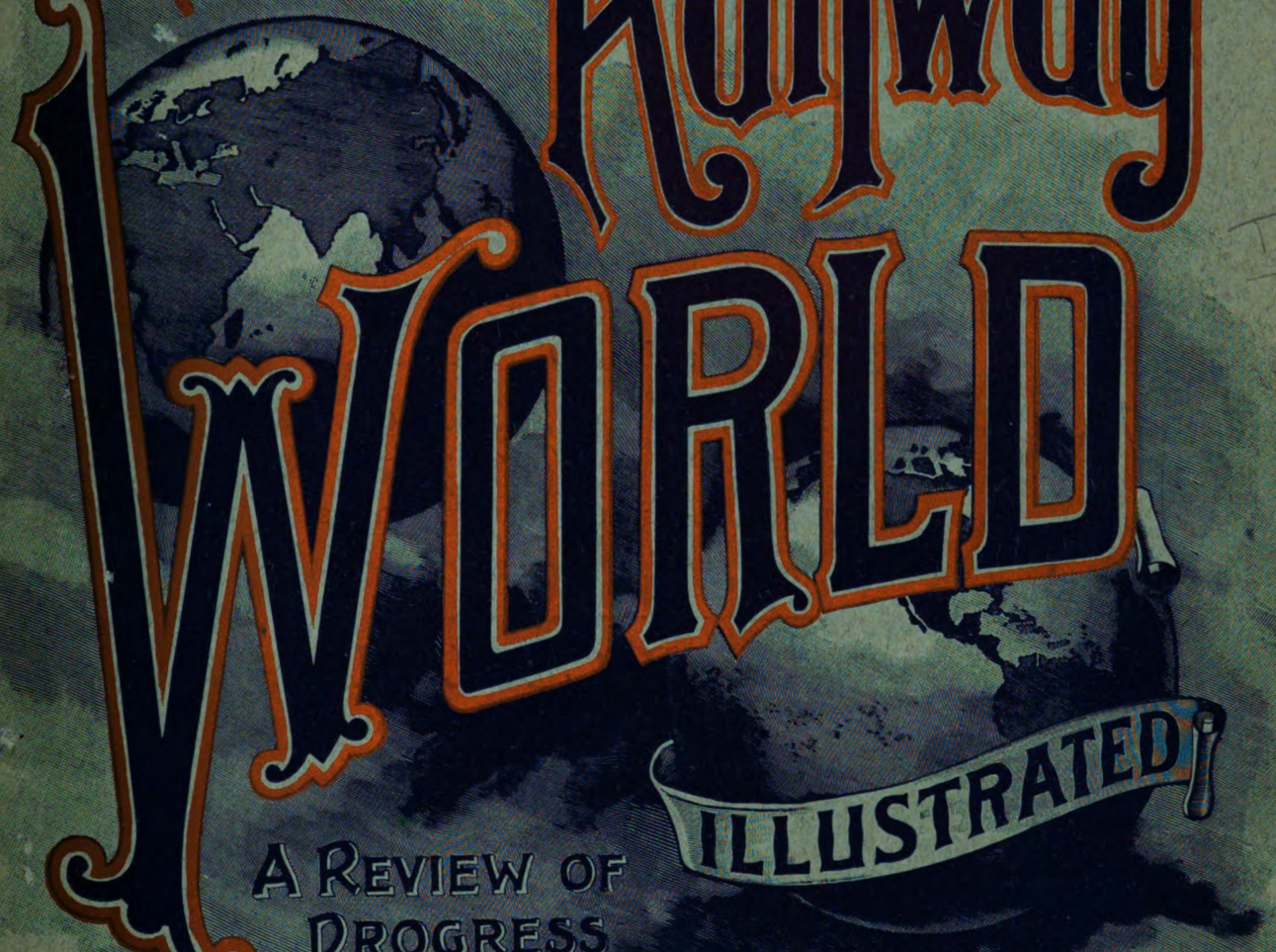

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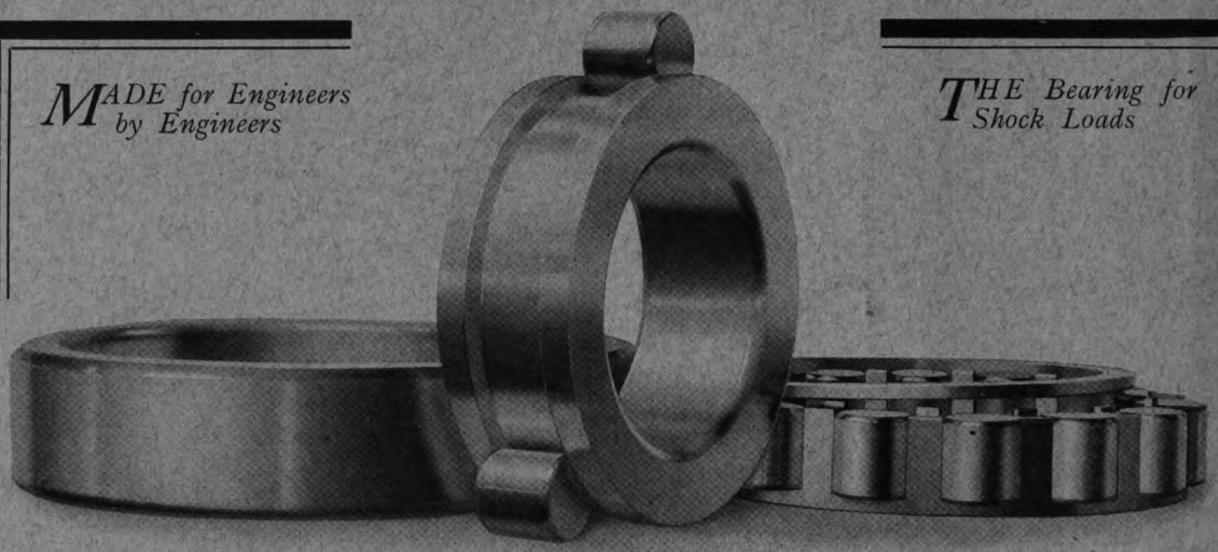

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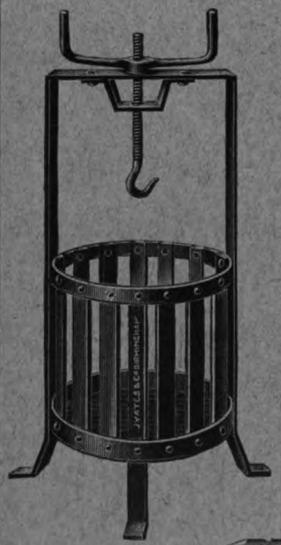

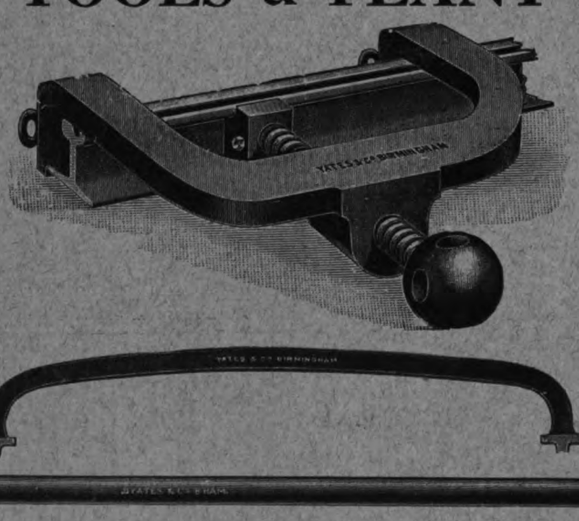

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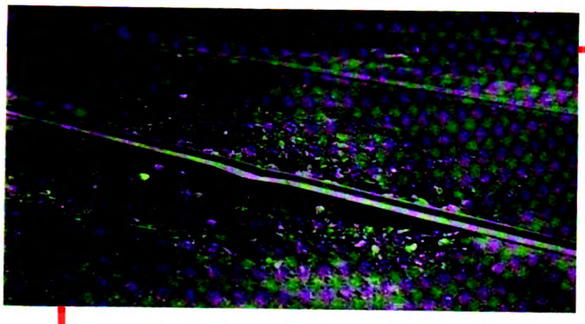

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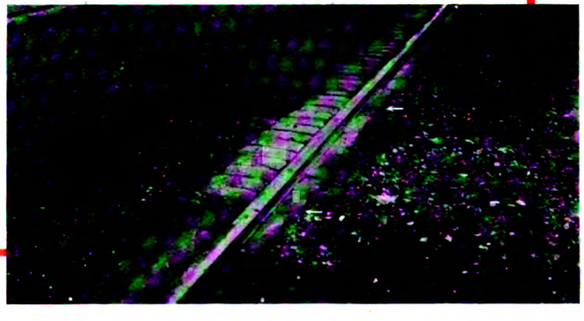

"The Thermit Joint Made and the Track Repaired."

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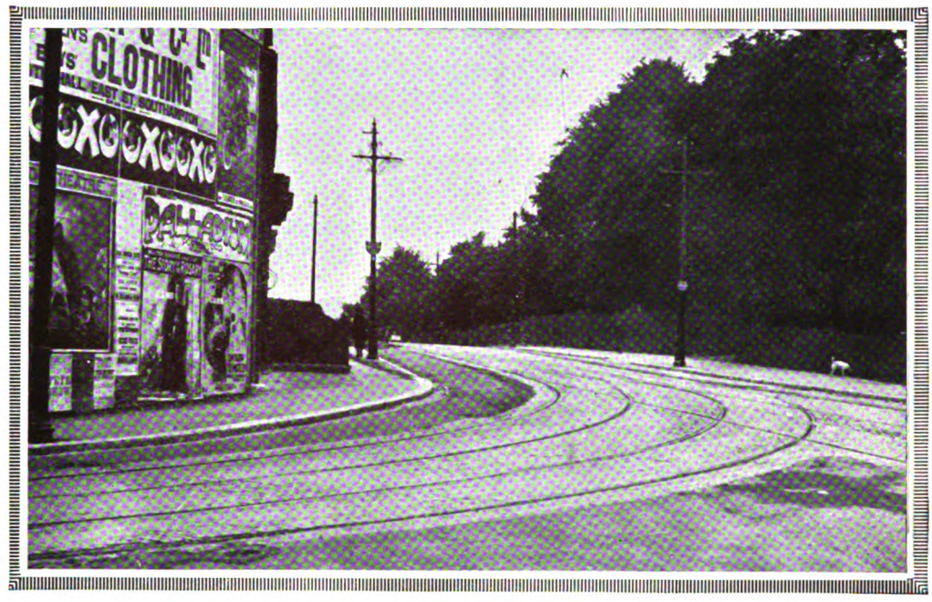

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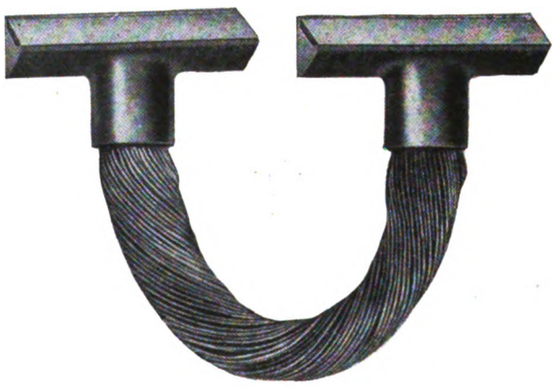

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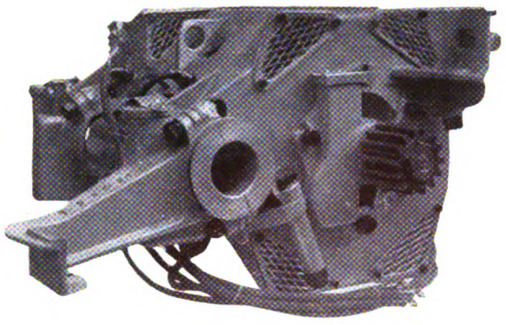

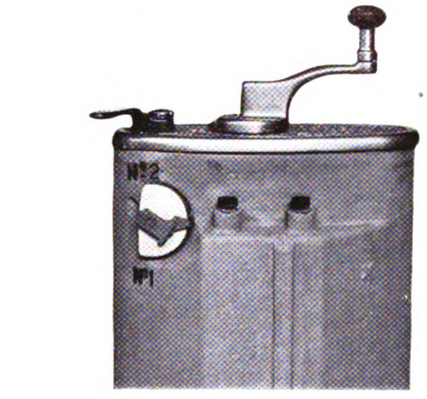

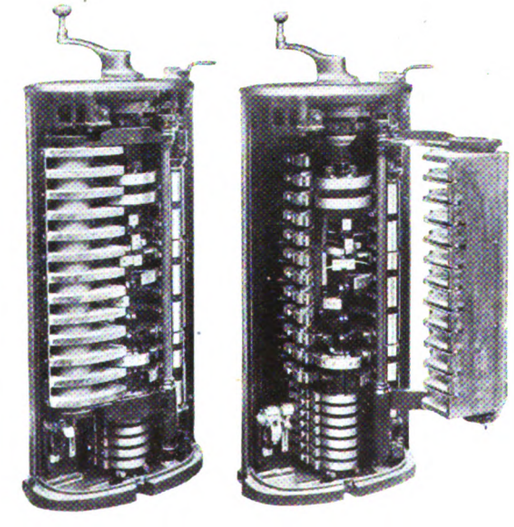

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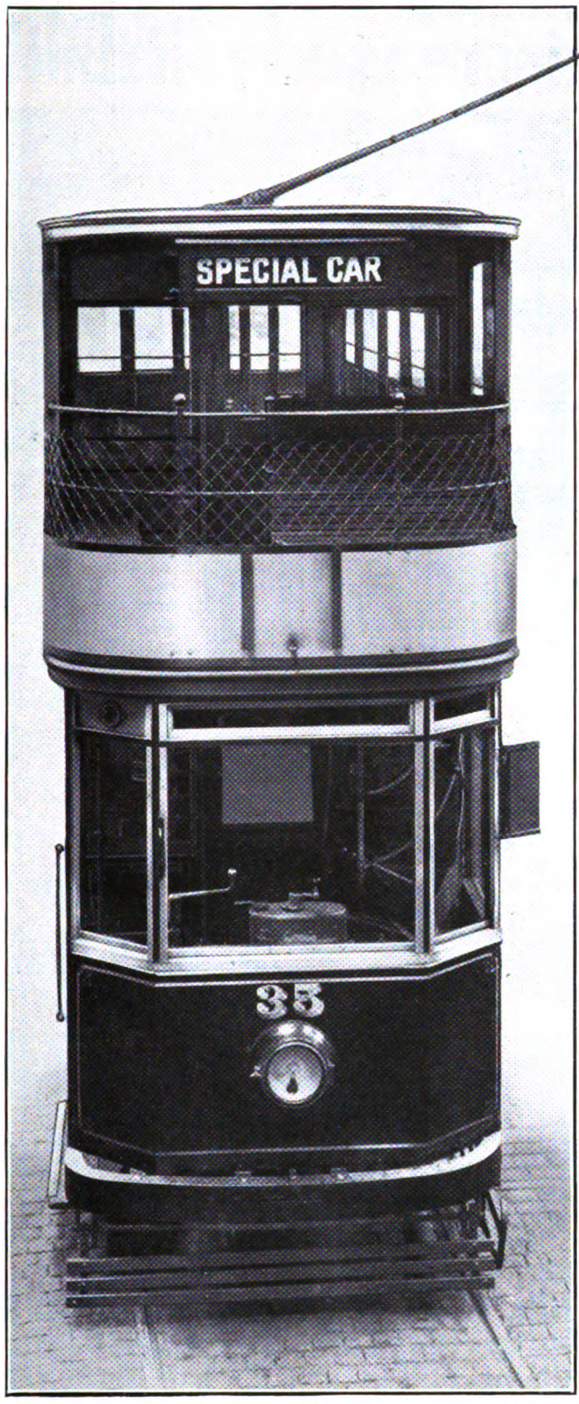

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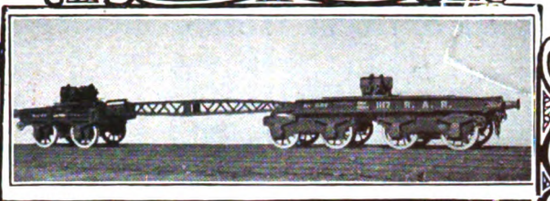

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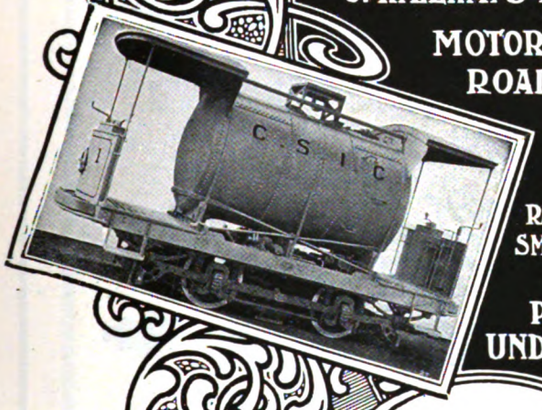

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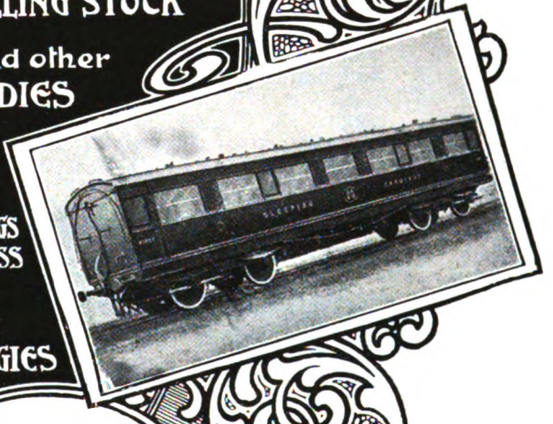

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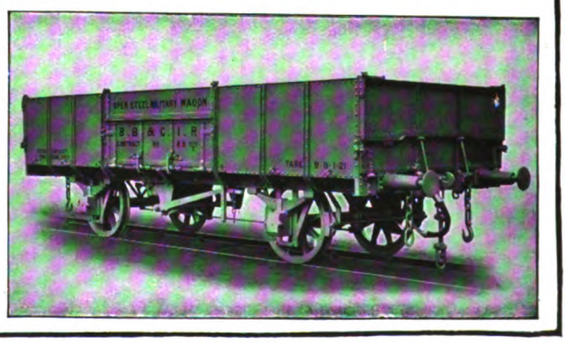

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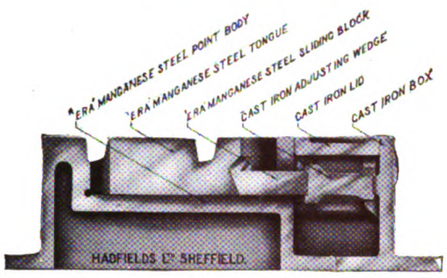

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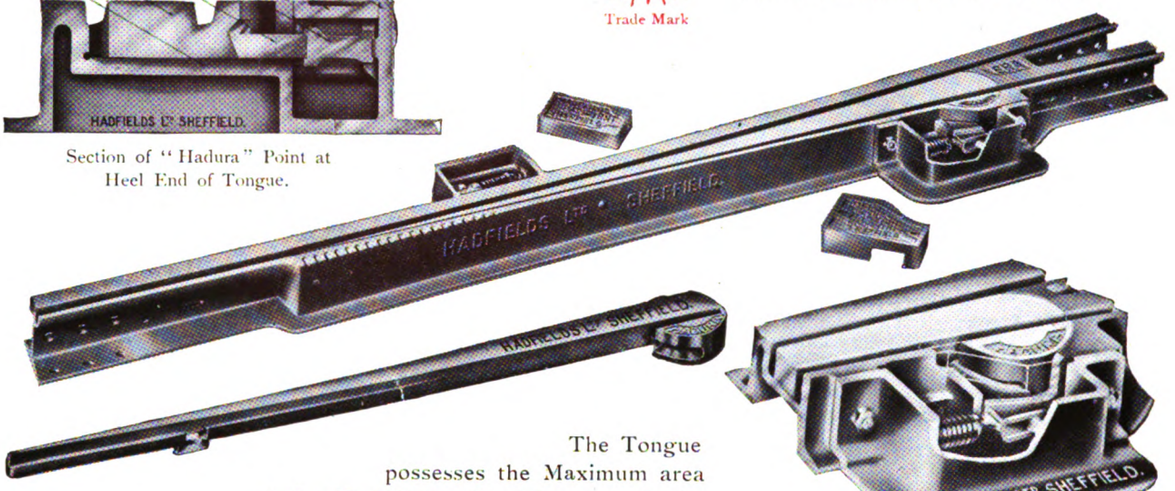
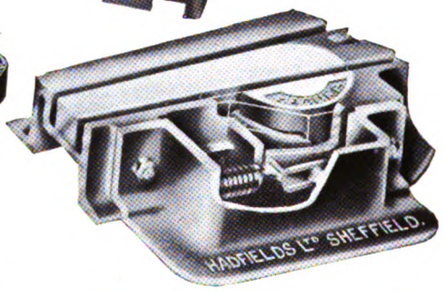


The Tongue possesses the Maximum area at the Heel End. Provision is made for automatically taking up slackness as wear takes place



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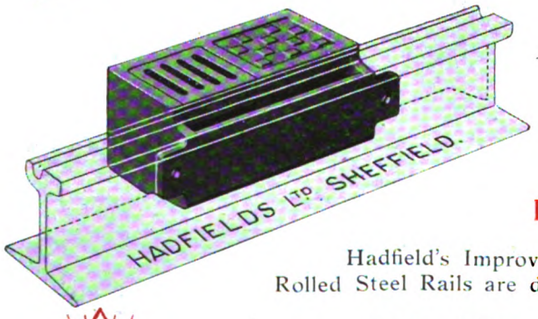

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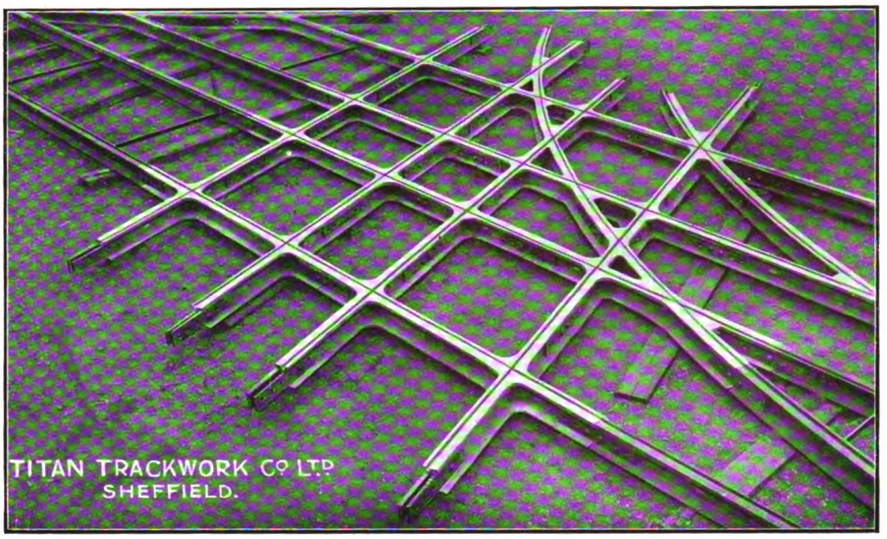

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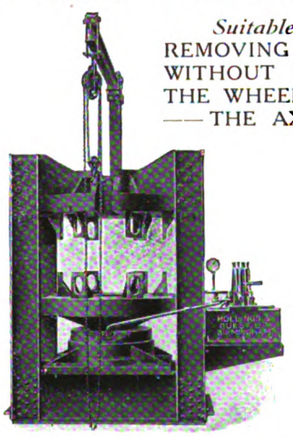

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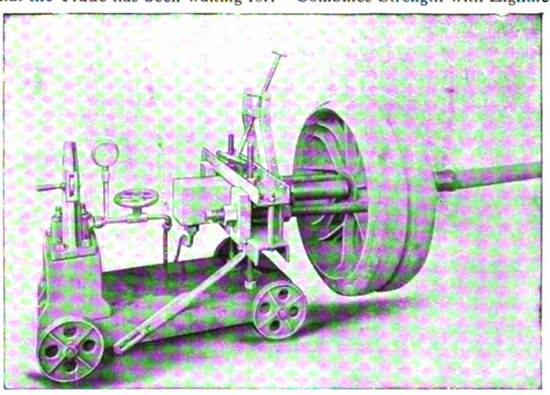

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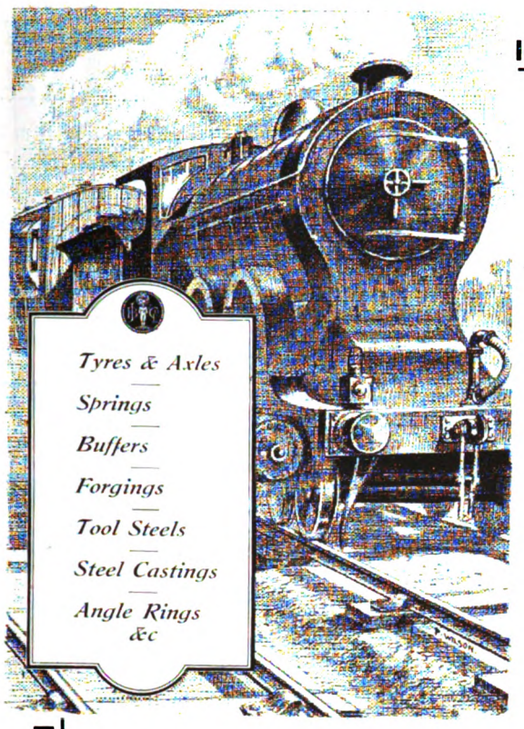

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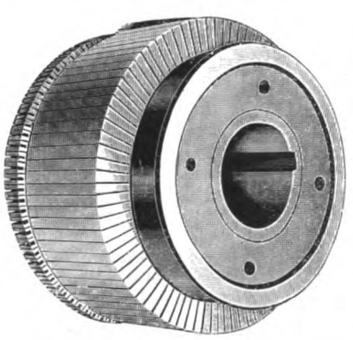
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Hadfields, Ltd., Sheffield.

IGNITION LEADS (FOR MOTOR CARS).
Henley's Telegraph Works Co., Ltd., London.
Kalker, E., & Co., Coventry.

INDICATORS. (See Destination Indicators.

INSULATING MATERIAL.
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Fleming, Birkby & Goodall, Ltd., Liversedge.
Kalker, E., & Co., Coventry.
Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

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British Thomson-Houston Co., Ltd., Rugby.
English Electric & Siemens Supplies, Ltd.
Equipment & Engineering Co., London, W.C
Fleming, Birkby & Goodall, Ltd., Liversedge.
Henley's Telegraph Works Co., Ltd., London.
Metropolitan-Vickers Elec. Co., Manchester.
Tramway Supplies, Ltd., Leeds.
Williams & Pell, London, W.C.
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Brockhouse, J., & Co., Ltd., West Bromwich

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Thermit, Limited, London, S.W.

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Peckham Truck and Eng. Co., London, E.C.

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LAMPS, ELECTRIC.
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General Seating Co., Ltd., London, S.W.

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Equipment & Engineering Co., London, W.C.
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English Electric & Siemens Supplies, Ltd.
Equipment & Engineering Co., London, W.C.
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British Thomson-Houston Co., Ltd., Rugby.
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English Electric & Siemens Supplies, Ltd.
Equipment & Engineering Co., London, W.C.
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Tramway Supplies, Ltd., Leeds.
Wiseman, Alfred, Ltd., Birmingham.

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Brill Company, J. G., London, W.C.1.
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Thornycroft, John I. & Co. Ltd., London.
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Brill Company, J. G., London, W.C.1.

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Allen-Liversidge, Ltd., London, S.W.1.

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Stewarts & Lloyds, Ltd., Glasgow.
Tramway Supplies, Ltd., Leeds.

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Peckham Truck and Eng. Co., London, E.C.
Thermit, Ltd., London, S.W.
Tramway Supplies, Ltd., Leeds.
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Rail Welding Co., London, W.
Thermit, Limited, London, S.W.
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(Continued on page xx.)

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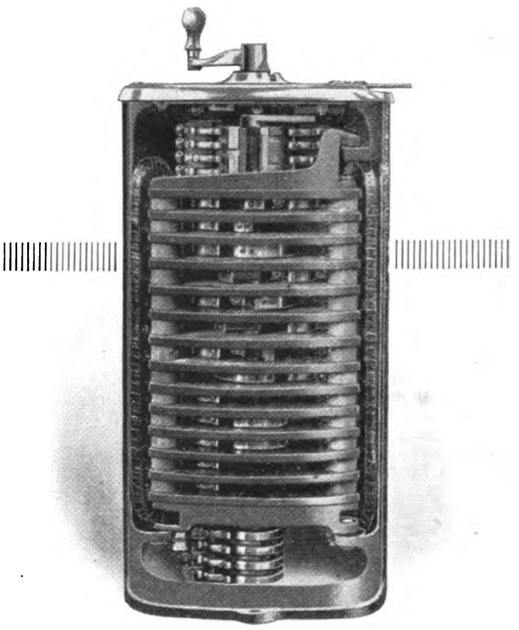

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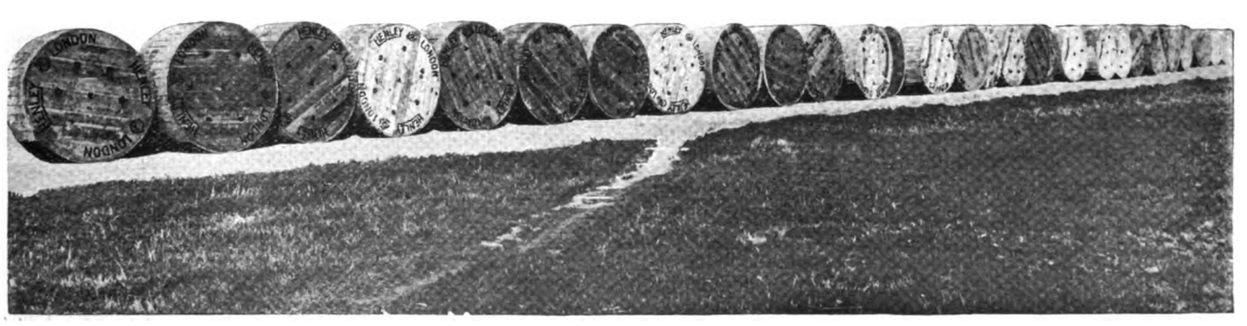

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Equipment & Engineering Co., London, E.C

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Lorain Steel Company, London.
Titan Trackwork Co., Ltd., Sheffield.

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English Electric Co., Ltd., London, W.C.
Metropolitan-Vickers Elec. Co., Manchester.

RAILWAY STORES.
Yates & Co., Ltd., John, Aston Manor.

RATTAN.
Brill Company, J. G., London, W.C.1.
Continental Railway & Tramway Supply Co.

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English Electric Co., Ltd., London, W.C.

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Empire Roller Bearings Co., London, S.W.

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Equipment & Engineering Co., London, W.C.

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English Electric Co., Ltd., London, W.C.

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Armstrong, Stevens & Son Ltd., Birmingham
Baker, John, & Co., Rotherham.
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Tramway Supplies, Ltd., Leeds.

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Brill Company, J. G., London, W.C.1.
English Electric Co., Ltd., London, W.C.

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Johnson & Phillips, Ltd., Charlton, S.E.
Metropolitan-Vickers Elec. Co., Manchester.
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Edison Swan Electric Co., Ltd., Ponders End, Middlesex.
English Electric Co., Ltd., London, W.C.
Johnson & Phillips, Ltd., Charlton, S.E.
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Baker, John, & Co., Rotherham.
Equipment & Engineering Co., London, W.C.
Hadfields, Ltd., Sheffield.

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Tilling-Stevens Motors, Ltd., Maidstone.
Tramway Supplies, Ltd., Leeds.

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Brill Company, J. G., London, W.C.1.
Electro-Mechanical Brake Co., W. Bromwich.
English Electric Co., Ltd., London, W.C.
Equipment & Engineering Co., London, W.C
Tramway Supplies, Ltd., Leeds.

TRACK SANDERS.
Brill Company, J. G., London, W.C.1.
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Equipment & Engineering Co., London, W.C.
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TROLLEY WIRE.
English Electric & Siemens Supplies, Ltd.
Equipment & Engineering Co., London, W.C.
Frederick Smith & Co., Salford, Manchester
Standard Underground Cable Co., London.
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TRUCK BRAKES.
Brill Company, J. G., London, W.C.1.
English Electric Co., Ltd., London, W.C.
Peckham Truck & Eng. Co., London, E.C.
Tramway Supplies, Ltd., Leeds.

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Electro-Mechanical Brake Co., W. Bromwich.
English Electric Co., Ltd., London, W.C.
Lorain Steel Company, London, E.C.

VARNISHES.
Docker Bros., Ltd., London.
Fleming, Birkby & Goodall, Ltd., Liversedge.
Pinchin, Johnson, & Co., Ltd., London, E.C.

WASHERS.
Terry & Sons, Ltd., Herbert, Redditch.

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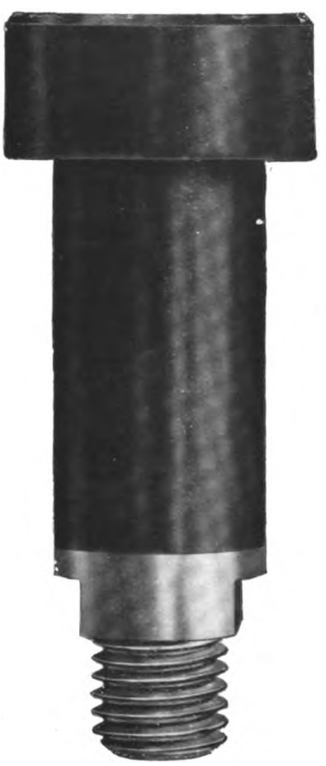

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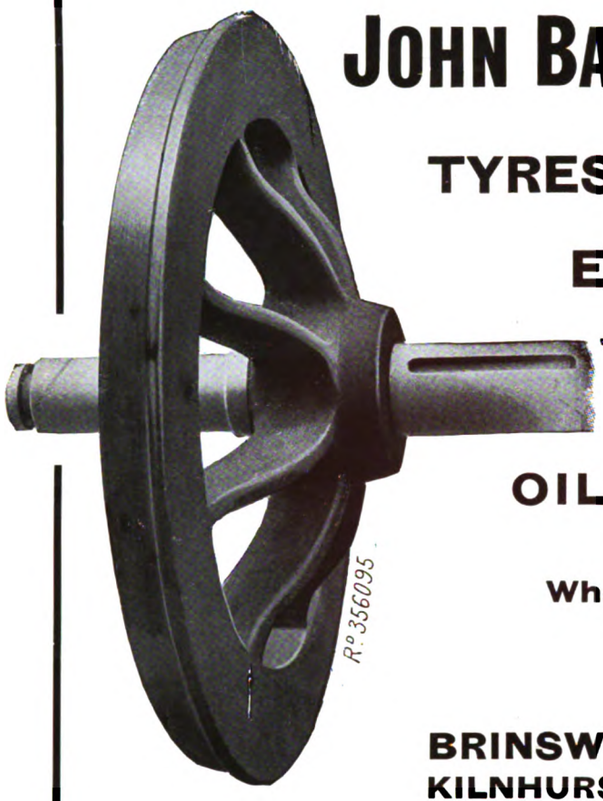

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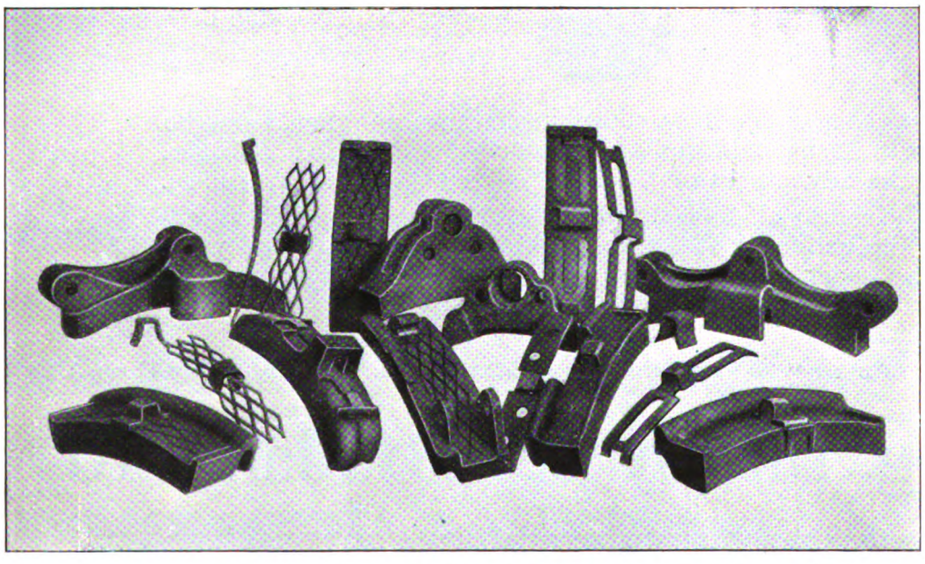

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DIRECTORIES OF ELECTRIC TRAMWAYS
IN THE UNITED KINGDOM

Municipal Tramways pp. xxiii-xxiv. Company Tramways pp. xxiv-xxvi. Tramway Associations p. xxvi.

NAMES OF PRINCIPAL OFFICERS
POSTAL ADDRESS, TELEGRAPHIC ADDRESS, AND TELEPHONE NUMBERS

***** In order that these Directories may be kept up to date, it is specially requested that intimation of all changes be sent promptly.**

Aberdare Urban District Tramways, Gadlys Estate, Aberdare. [T.A., Tramways, Aberdare: T.N., 17.] *Gen. Manager and Elec. Engineer*, A. J. Abraham; *Traffic Supt.*, H. King; *Chairman Try. Com.*, Coun. R. L. Berry.

Aberdeen Corporation Tramways, Municipal Buildings, Union Street, Aberdeen. [T.A., Trams, Aberdeen: T.N. 826.] *Gen. Manager and Eng*, W. Forbes; *Per. Way Eng.*, J. Gordon (*Burgh Surveyor*); *Chairman Try. Com.*, Coun. D. W. Beaton.

Accrington Corporation Tramways, Market Hall, Accrington. [T.A., Trams, Accrington; T.N., 2212.] *Gen. Manager and Eng.*, H. Pilling; *Per. Way Eng.*, W. J. Newton; *Chairman Try. Com.*, Ald. T. E. Higham; *Vice-Chairman*, Coun. F. Lord.

Ashton-under-Lyne Corporation Tramways, Tramway Depot, Mossley Road, Ashton. [T.A., Tramways, Ashton; T.N., 325.] *Gen. Manager*, Ernest Holt; *Elec. Eng.*, N. Appelbee; *Chairman Try. Com.*, Ald. R. S. Oldham; *Vice-Chairman*, Ald. C. H. Waterhouse.

Ayr Corporation Tramways, Town Building, Ayr. [T.A., Trams, Ayr; T.N., 123.] *Gen. Manager and Eng.*, William Grant; *Burgh Elec. Eng.*, R. Marshall; *Per. Way Eng.*, John Young; *Rolling Stock Supt.*, Alf. Somerville; *Convener Try. Com.*, Bailie J. Smith; *Vice-Chairman*, Coun. T. Murray.

Bacup Corporation Tramways.—Town Hall, Bacup, Lancs. [Lines leased to and worked by Rawtenstall Corporation.] *Town Clerk*, J. Entwistle; *Boro' Eng.*, G. Bradley; *Chairman Try. Com.*, Coun. J. Ireland; *Vice-Chairman*, Ald. J. H. Lord.

Barking Town Urban District Tramways, East Street, Barking. [T.N., 156 East Ham.] *Eng. and Manager*, W. Holmes; *Acting Engineer and Manager*, W. E. Kidner; *Chairman Try. Com.*, Coun. A. Whiting.

Barrow Corporation Tramways, Salthouse Road, Barrow-in-Furness. *Manager*, J. R. Groves; *Chairman Try. Com*, Lieut.-Col. R. Thompson.

Barton-upon-Irwell District Council Light Railways, Barton-upon-Irwell.
[Line leased to and worked by the Lancashire United Tramways Co., *q.v.*]

Batley Corporation Tramways, Batley, Yorks. *Engineer*, S. D. Jones; *Chairman Try. Com.*, Coun. F. W. H. Auty; *Vice-Chairman*, Coun. J. W. Schofield.
[Lines leased to and worked by the Yorkshire (Woollen District) Electric Tramways, Ltd., *q.v.*]

Belfast City Tramways, Tramways Office, Sandy Row, Belfast. [T.A., Tramways, Belfast; T.N., 2444.] *Gen. Manager*, J. S. D. Moffet; *Traffic Manager*, R. McMaster; *City Elec. Eng.*, T. W. Bloxam; *Per. Way Eng.*, E. S. Pinkerton; *Chief Eng.*, H. Vernon; *Chairman Try. Com.*, Coun. W. G. Turner; *Vice-Chairman*, Coun. D. Anderson.

Bexley Urban District Council Tramways and Dartford Light Railways, Broadway, Bexleyheath, Kent. [T.A., Makin, Tramways, Bexley; T.N., 79.] *Gen. Manager and Elec. Eng.*, J. Makin; *Chairman Try. Com.*, Coun. A. J. Franklin.

Birkenhead Corporation Tramways, Laird Street, Birkenhead. [T.A., Tramways Manager, Birkenhead; T.N., 1110.] *Gen. Manager*, C. Clarke; *Borough Sur. and Eng.*, C. Brownridge; *Rolling Stock Supt.*, R. Chadwick; *Chairman Try. Com.*, Coun. H. Halsall; *Vice-Chairman*, Ald. S. Vaughan.

Birmingham Corporation Tramways, The Council House, Congreve Street, Birmingham. [T.A., Trams, Birmingham; T.N., Central 7,000.] *Gen. Manager*, A. Baker; *Elec. Engineer*, A. C. Baker; *Traffic Supt.*, J. McDonnell; *Per. Way Eng.*, C. E. S. Bill; *Chief Engineer*, R. H. Dickinson; *Car Works Supt.*, T. C. Winfield; *Chairman Try. Com.*, Coun. F. Smith.

Blackburn Corporation Tramways, Tramways Office, Blackburn. [T.A., Tramways, Blackburn; T.N., 4321.] *General Manager*, J. H. Cowell; *Elec. Eng.*, P. P. Wheelwright; *Traffic Manager*, R. Riley; *Car Shed Supt.*, H. W. Seymour; *Chairman Try. Com.*, Ald. C. Higham; *Vice-Chairman*, Coun. Geo. Burke.

Blackpool Corporation Tramways, West Caroline Street, Blackpool. [T.N., 67.] *Gen. Manager*, C. Furness; *Traffic Supt.*, C. I. Baker; *Resident Eng.*, F. Field; *Chairman Try. Com.*, Coun. H. Brooks; *Vice-Chairman*, Coun. T. G. Lumb.

Bolton Corporation Tramways, Bradshawgate, Bolton. [T.A., Manager, Tramways, Bolton; T.N., 490.] *General Manager*, J. Barnard; *Elec. Eng.*, W. J. H. Wood; *Per. Way Eng.*, E. Ll. Morgan; *Rolling Stock Supt.*, C. Beech; *Chairman Try. Com.*, Coun. J. R. Horrocks; *Vice-Chairman*, Ald. P. Higson.

Bootle Corporation Tramways, Electricity Works, Pine Grove, Bootle. [T.N., 424.] *Elec. Eng.*, T. D. Clothier; *Chairman Try. Com.* Ald. Booth; *Vice-Chairman*, Coun. Ashton.
[Lines worked by Liverpool Corporation Tramways.]

Bournemouth Corporation Tramways, Tramways Offices, Lansdowne Crescent, Bournemouth [T.A., Tramways, Bournemouth; T.N., 1701.] *General Manager*, I. Bulfin; *Chief Assistant & Elec. Eng.*, H. Vickers; *Traffic Supt.*, G. F. Glass; *Chairman Try. Com.*, Coun. J. Wilson; *Vice-Chairman*, Coun. W. H. Ridout.

Bradford Corporation Tramways, Central Office, 7, Hall Ings, Bradford. [T.A., Tramways, Bradford; T.N., 2381 and 2382.] *Gen. Manager*, R. H. Wilkinson; *Asst. Elec. Eng.*, Johnstone Wright; *Traffic Supt.*, T. Stirk; *City Elec. Eng.*, T. Roles: *Chairman Try. Com.*, Ald. Enoch Priestley; *Vice-Chairman*, Coun. Taylor.

Brighton Corporation Tramways, Lewes Road, Brighton. [T.A., Tramways, Brighton; T.N., 353 P.O.] *Eng. & Manager*, William Marsh; *Traffic Supt.*, W. N. Brooks; *Rolling Stock Supt.*, W. Orchard; *Per. Way Eng.*, F. N. Hudson; *Chairman Try. Com.*, Ald. J. Lintott.

Burnley Corporation Tramways, Queen's Gate, Burnley. [T.N., 46.] *Gen. Manager*, Henry Mozley; *Boro. Elec. Eng.*, J. E. Starkie; *Boro. Surveyor*, G. H. Pickles; *Chairman Try. Com.*, Coun. L. Thornber; *Vice-Chairman*, Coun. Eastwood.

Burton-on-Trent Corporation Tramways, Guild Street, Burton-on-Trent. [T.N., 202.] *Manager*, A. B. Slater; *Engineer*, T. Hall; *Chairman Try. Com.*, Ald. J. S. Rowland; *Vice-Chairman*, Ald. T. E. Lowe.

Bury Corporation Tramways. Market Place, Bury. [T.N., 26.] *Gen. Manager*, Frank Buckley; *Boro. Elec. Eng.*, S. J. Watson; *Chairman Try. Com.*, Ald. T. S. Collinge, J.P.; *Vice-Chairman*, Ald. H. Hargreaves.

Cardiff Corporation Tramways, Central Offices, The Hayes, Cardiff. T.N., 1211, 1240, 1350, and 377.] *Gen. Manager*, R. L. Horsfield; *Elec. Eng.*, C. G. M. New; *Traffic Manager*, H. David; *Rolling Stock Supt.*, Jas. Preston; permanent way under supervision of *City Engineer*, E. J. Elford; *Chairman Try. Com.*, Coun. S. O. Jenkins; *Vice-Chairman*, Coun. A. E. Gough.

Chester Corporation Tramways, Station Road, Chester. [T.N., 166.] *Manager*, W. H. Ellis; *Elec. Eng.*, S. E. Britton; *Per. Way Eng.*, W. M. Jones; *Chairman Try. Com.*, Ald. J. Jones; *Vice-Chairman*, Coun. A. S. Dutton.

Chesterfield Corporation Tramways, Chatsworth Road, Chesterfield. [T.A., Tramways, Chesterfield; T.N., 78.] *Gen. Manager*, R. H. Campion; *Assist. Gen. Manager*, ———— *Chairman Try. Com.*, Coun. P. M. Robinson; *Vice-Chairman*, Ald. Sir E. Shentall.

Colchester Corporation Tramways, Magdalen Street, Colchester. [T.A., Tramways, Colchester; T.N., 92.] *Gen. Manager and Engineer*, R. C. Bullough; *Chairman Try. Com.*, Coun. G. F. Wright; *Vice-Chairman*, Coun. T. W. Watts.

Colne Corporation Tramways, Colne, Lancashire. *Gen. Manager and Engineer*, J. H. Thompson; *Chairman Try. Com.*, Coun. J. Thompson; *Vice-Chairman*, Coun. R. Knight.

Coventry Corporation Tramways, Priestley's Bridge, Coventry. [T.A., Tramways, Coventry; T.N., 1014.] *Engineer and General Manager*, T. R. Whitehead; *Chief Engineer*, P. H. Roscoe; *Accountant and Chief Clerk*, H. A. Goodyer; *Chairman*, Coun. E. O. French; *Vice-Chairman*, Coun. J. I. Bates.

Croydon Corporation Tramways, Tramways Office, Thornton Heath, Surrey. [T.A., Tramways, Croydon; T.N., 406, Croydon.] *Tramways Manager*, T. B. Goodyer; *Chairman Try. Com.*, Coun. A. A. Thomson; *Vice-Chairman*, Ald. G. J. Allen, J.P.

Darlington Corporation Tramways, Haughton Road, Darlington. [T.A., Tramways, Darlington; T.N., 2435.] *General Manager and Elec. Eng.*, J. R. P. Lunn; *Traffic Supt.*, J. Fraser; *Chairman Try. Com.*, Ald. Sir C. Starmer.

Dartford Urban District Council Light Railways, Dartford. *Chairman Try. Com.*, Coun. A. J. Franklin.
[Lines worked by Bexley U.D. Council, *q.v.*]

Darwen Corporation Tramways, Lorne Street, Darwen. [T.N., 104.] *Gen. Manager and Eng.*, G. A. Newsome; *Boro. Elec. Eng.*, F. M. Fletcher; *Chairman Try. Com.*, Coun. G. Butterworth; *Vice-Chairman*, Coun. G. Pickup.

Derby Corporation Tramways, 4, Victoria Street, Derby. [T.N., 410.] *Gen. Manager*, F. Harding; *Elec. Eng.*, T. P. Wilmshurst; *Per. Way Eng.*, J. Ward; *Chairman Try. Com.*, Coun. W. Eaton, J.P.

Doncaster Corporation Tramways, Grey Friar's Road, Doncaster. [T.A., Rayner, Doncaster, T.N., 43.] *Manager*, T. Potts; *Elec. Eng.*, S. R. Windle; *Chairman Try. Com.*, Ald. S. Balmforth; *Vice-Chairman*, Coun. T. Bramworth.

Dover Corporation Tramways, Town Hall, Dover. [T.A., Trams, Dover; T.N., 294.] *Gen. Manager*, E. H. Bond; *Per. Way Eng.*, Wm. Boulton Smith (Boro. Surveyor); *Chairman Try. Com.*, Coun. Barwick (Mayor); *Vice-Chairman*, Coun. Thomas.

Dundee Corporation Tramways, Town House Buildings, Dundee. [T.N., 1340]; *Gen. Manager and Eng.*, W. T. Young; *Elec. Eng.*, H. Richardson; *City Eng.*, J. Thomson; *Chairman Try. Com.*, Coun. J. G. Fraser.

East Ham Corporation Tramways, Nelson Street, East Ham. [T.N., 811 and 100 East Ham.] *Gen. Manager and Elec. Eng.*, W. C. Ullmann; *Chairman Try. Com.*, Coun. H. I. Rolf; *Vice-Chairman*, Coun. H. N. Ridley.

Eccles Corporation Tramways, Eccles. *Elec. Eng.*, H. W. Angus; *Per. Way Eng.*, T. S. Picton; *Chairman Try. Com.*, Coun. Alexander; *Vice-Chairman*, Ald. Pearson. [Lines worked by Salford Corporation.]

Edinburgh Corporation Tramways, 2, St. James' Square, Edinburgh. *Gen. Manager*, R. S. Pilcher; *Traffic Supt.*, R. McLeod; *Burgh Engineer*, A. H. Campbell; *Chairman Try. Com.*, Coun. C. J. M. Mancor.
[The entire system of the Edinburgh tramways is at present worked by cable traction, with the exception of 1¼ miles of electric lines. The Council has decided to electrify the whole of the system, and the work has been commenced.]

Erith Urban District Council Tramways, Tramway Depôt, Walnut Tree Road, Erith. [T.A., Tramways, Erith; T.N., 86.] *Gen. Manager and Elec. Engineer*, J. C. Williams; *Chairman Try. Com.*, Coun. W. F. B. Howell.

Exeter Corporation Tramways, Heavitree Road, Exeter. *Gen. Manager*, R. O. Baldwin; *Elec. Eng.* H. D. Munro; *Per. Way Eng.*, T. Moulding; *Chairman Try. Com.*, Coun. F. Chick; *Vice-Chairman*, Coun. W. Brock.

Farnworth Urban District Council Tramways, Albert Road, Farnworth. *Chairman Try. Com.*, Coun. Winter; *Vice-Chairman*, Coun. R. H. Cunliffe, J.P.
[Lines leased to the South Lancashire Trys. Co.]

Glasgow Corporation Tramways, 46, Bath Street, Glasgow. [T.A., Trams, Glasgow; T.N., 1040, Douglas.] *Gen. Manager*, J. Dalrymple; *Deputy Gen. Manager*, L. Mackinnon; *Chief Eng.*, J. Ferguson; *Elec. Eng.*, ———— *Sec. and Treasurer*, J. N. Wilson; *Chairman Try. Com.*, Bailie J. M'Whirr; *Vice-Chairman*, Bailie R. Laing.

Gloucester Corporation Light Railway, Bristol Road Depôt, Gloucester. [T.A., Tramways, Gloucester; T.N. 155.] *Gen. Manager and Elec. Eng.*, F. H. Corson; *Chairman Try. Com.*, Coun. J. O. Roberts (Mayor); *Vice-Chairman*, Coun. W. Colwell.

Great Yarmouth Corporation Tramways, Caister Road, Great Yarmouth. [T.N. 265.] *Gen. Manager*, F. L. Turner; *Elec. Eng.*, Gordon Bryant; *Per. Way. Eng.*, J. W. Cockrill (Borough Surveyor); *Chairman Try. Com.*, Ald. D. McCowan; *Vice-Chairman*, Coun. R. H. Tunbridge.

Halifax Corporation Tramways, Skircoat Road, Halifax. [T.N., 86.] *General Manager*, B. Hall; *Try. Eng.*, J. W. Galloway; *Chairman Try. Com.*, Ald. Thos. Hey, J.P. (Mayor); *Vice-Chairman*, Ald. H. H. Sutcliffe.

Haslingden Corporation Tramways, John Street, Haslingden. *Gen. Manager, Elec. Eng., and Per. Way Eng.*, Barnes Kay; *Chairman Try. Com.*, Coun. Haworth; *Vice-Chairman*, Ald. E. Russell.

Herne Bay Pier Tramway (owned and worked by Herne Bay U.D.C.), Herne Bay. [T.N., 22.] *Res. Manager*, P. W. Carey.

Heywood Corporation Tramways, Heywood, Lancs. [T.N., 47.] *Gen. Manager*, D. H. Davies; *Per. Way Eng.*, J. B. Nuttall; *Chairman Try. Com.*, Ald. J. Ashworth, J.P.; *Vice-Chairman*, Coun. Nuttall.

Huddersfield Corporation Tramways, John William Street, Huddersfield. [T.N., 698 and 898.] *Gen. Manager and Eng.*, A. A. Blackburn; *Track Eng.* W. Jaggar (Borough Eng.); *Elec. Eng.*, J. W. Turner; *Traffic Supt.*, T. Hartley; *Chairman Try. Com.*, Ald. E. H. Sellers; *Vice-Chairman*, Coun. T. Canby.

Hull Corporation Tramways, Alfred Gelder Street, Hull. [T.N., 444, Corporation] *Manager*, E. S. Rayner; *Traffic Supt.*, C. F. Ellwood; *Engineer*, F. W. Bricknell (City Engineer) [T.N., 943, Corporation]; *Chairman Try. Com.*, Coun. A.D. Willoughby; *Vice-Chairman*, Coun. C. P. Sherwood.

Ilford Urban District Council Tramways, Ley Street, Ilford. [T.N., 684.] *Manager and Engineer*, L. E. Harvey; *Chairman Try. Com.*, Coun. G. R. Davey; *Vice-Chairman*, Coun. H. L. Crofts.

Ipswich Corporation Tramways, Constantine Road, Ipswich. [T.A., Black, Tramways, Ipswich; T.N., 354.] *Gen. Manager and Elec. Eng.*, A. S. Black; *Traffic Supt.*, A. Butler; *Rolling Stock Supt.*, W. A. Fairhead; *Chairman Try. Com.*, Coun. E. C. Ransome (Mayor); *Vice-Chairman*, Coun. W. P. Burton.

Kearsley Urban District Council Tramways, Council Office, Kearsley, Farnworth, S.O. *Clerk U. D. C.*, H. Martin.
[Lines leased to and worked by the South Lancashire Tramways Co.]

Keighley Corporation Tramways, South Street, Keighley. [T.A., Tramways, Keighley; T.N. 263.], *Gen. Manager and Tramways Engineer*, J. A Bromley: *Boro. Elec. Eng.*, H. Webber; *Chairman Try. Com.*, Coun. J. Crabtree.

Kilmarnock Corporation Tramways Electricity Works, Kilmarnock. [T.N., 95.] *Elec. Eng. and Manager*, J. H. Menzies *Consulting Engineers*, Kennedy and Jenkin; *Convener Try. Com.*, Coun. R. Dunlop.

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ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Kirkcaldy Corporation Tramways, Electricity Works Victoria Road, Kirkcaldy. [T.A., Tramways, Kirkcaldy. T.N., 124, 174, and 175.] *Manager & Elec. Eng.*, O. F. Francis; *Traffic Manager*, Jas. Fisher; *Chairman Try. Com.*, Coun. G. Fergusson.

Lancaster Corporation Tramways, Electricity Works, Lancaster. [T.A., Milnes, Tramways, Lancaster; T.N., 1, L.] *Gen. Manager & Elec. Eng.*, G. C. Milnes; *Acting Boro. Electrical Engineer and Tramways Manager*, J. B. Patterson; *Traffic Manager*, W. T. Charlton; *Chairman Try. Com.*, Coun. J. J. Curwen.

Leeds City Tramways, Swinegate, Leeds. [T.A., Tramways, Leeds; T.N., 21601; *General Manager*, J. B. Hamilton; *Traffic Supt.*, A. Daggett; *Elec. Eng.*, John Burbridge; *Highways and Per. Way Eng.*, E. W. Cockerlyne; *Car Works Supt.*, G. E. Watmough; *Chairman Try. Com.*, Ald. R. A. Smithson; *Vice-Chairman*, Ald. H. Brown.

Leicester Corporation Tramways, 20 and 22, Humberstone Gate, Leicester. [T.N., 2177.] *Manager & Sec.*, A. F. Lucas; *City & Try. Eng.*, E. G. Mawbey; *City Elec. Eng.*, T. R. Smith; *Cons. Engs.*, Kincaid, Waller & Manville; *Chairman Try. Com.*, Ald. G. Banton, J.P.; *Vice-Chairman*, Coun. Billings.

Leith Corporation Tramways, 165, Leith Walk, Leith. [T.N., 415.]—Incorporated with Edinburgh Tramways.

Leyton District Council Tramways, Car Depot, Lea Bridge Road, Leyton, E. [These Tramways are now worked by the London County Council.]

Lincoln Corporation Tramways, Burton Road, Lincoln. [T.N., 213]. *General Manager*, Richard Hoggard; *City Elec. Eng.*, Stanley Clegg; *Chairman Tramways and Motors Com.*, Ald. W. S. White.

Liverpool Corporation Tramways, 24, Hatton Garden, Liverpool. [T.A., Tramways, Liverpool; T.N., 2580 and 3880, Central.] *General Manager*, P. Priestly; *Per. Way Eng.*, J. A. Brodie (*City Engineer*); *Rolling Stock Supt.*, J. W. Thorpe; *Chairman Try. Com.*, Coun. F. C. Wilson; *Vice-Chairman*, Ald. F. Smith, J.P.

London County Council Tramways, 23, Belvedere Road, Lambeth, London, S.E.1. [T.A., Lotram, Watloo, London; T.N., 3150 Hop.] *General Manager*, A. L. C. Fell; *Traffic Manager*, J. K. Bruce; *Electrical Engineer*, P. L. Riviere; *Rolling Stock Eng.*, W. E. Ireland; *Per. Way Eng.*, J. Welling; *Chairman Highways Com.*, W. J. Squires; *Vice-Chairman*, Lieut.-Comm. A. Cooper Rawson.

Lowestoft Corporation Tramways, Norwich Road, Lowestoft. [T.N., 87.] *Gen. Manager*, H. H. Saunders; *Elec. Eng.*, W. R. May; *Chairman Try. Com.*, Coun. F. Spashett; *Vice-Chairman*, Coun. Walton.

Maidstone Corporation Tramways, Tramway Offices, Tonbridge Road, Maidstone. [T.A., Lambert, Tramways, Maidstone; T.N., 448] *Gen. Manager and Elec. Eng.*, A. T. Lambert; *Chairman Try. Com.*, Ald. D. T. J. Lyle (Mayor); *Vice-Chairman*, Coun. T. J. Armstrong.

Manchester Corporation Tramways, 55, Piccadilly, Manchester. [T.A., Tramways, Manchester; T.N., 7800 City.] *Gen. Manager*, J. M. McElroy; *Asst. Manager*, James Wood; *Traffic Sup.*, J. T. Oakes; *Elec. Eng.*, J. J. McMahon; *Chief Civil Eng.*, H. Mattinson; *Rolling Stock Supt.*, G. R. Blackburn; *Chairman Try. Com.*, Ald. J. Bowes; *Vice-Chairman*, Ald. A. W. Chapman.

Middlesbrough Corporation Tramways, Middlesbrough. *Gen. Manager*, H. G. Jeken; *Chairman, Try. Com.*, Coun. E. Turner; *Vice-Chairman*, Ald. J. Calvert.

Middlesex County Council Light Railways, Middlesex Guildhall, Westminster, London, S.W. *County Eng.*, H. T. Wakelam, M.I.C.E.; *Chairman of Light Railways Com.*, County Ald. H. Burt; *Vice-Chairman*, County Ald. F. Goodyear.

Nelson Corporation Light Railways, Charles Street, Nelson. [T.N., 115.] *Manager and Elec. Eng.*, G. F. Nayler; *Per. Way Eng.*, W. Shackleton; *Chairman Try. Com.*, Ald. W. F. Cooke.

Newcastle-upon-Tyne Corporation Tramways, Manors, Newcastle. [T.A., Traction, Newcastle; T.N., 5193 Central.] *Gen. Manager and Engineer*, Ernest Hatton; *Traffic Supt.*, T. Chalder; *Per. Way Eng.*, W. J. Steele; *Chairman Try. Com.*, Ald. R. Mayne; *Vice-Chairman*, Coun. Sir A. M. Sutherland.

Newport (Mon.) Corporation Tramways, Town Hall, Newport, Mon. [T.A., Dynamo, Newport, Mon.; T.N., 3111 and 2932, Nat.] *Gen. Manager*, N. J. Young; *Boro. Elec. and Tramways Eng.*, A. Nichols Moore; *Chairman Try. Com.*, Coun. J. Moxon; *Vice-Chairman*, Ald. F. Phillips.

Northampton Corporation Tramways. St. James', Northampton. [T.N., 279 & 280.] *Gen. Manager and Elec. Eng.*, J. F. Cameron; *Chairman Try. Com.*, Ald. James; *Vice-Chairman*, Coun. J. C. Wareing.

Nottingham Corporation Tramways, Beastmarket Hill, Nottingham. [Tramways, Nottingham; T.N., 225.] *General Manager & Elec. Eng.*, John Aldworth; *Traffic Supt.*, H. Morley; *Per Way Eng.*, Arthur Brown (*City Eng.*); *Rolling Stock Supt.*, W. Boot; *Chairman Try. Com.*, Coun. J. Clarkson; *Vice-Chairman*, Ald. A. Turney.

Oldham Corporation Tramways, Wallshaw Depot, Oldham. [T.A., Tramways, Oldham; T.N., 1195.] *Gen. Manager & Eng.*, Wm. Chamberlain; *Traffic Supt.*, M. Mullin; *Chairman Try. Com.*, Coun. J. K. Cheetham; *Vice-Chairman*, Coun. W. H. Sharpe.

Perth Corporation Tramways, 128, High Street, Perth. [T.N., 226 & 101.] *Tramways Manager*, W. G. Snell; *Elec. & Tramways Eng.*, John Lambert; *Per. Way Eng.*, R. McKillop (*Burgh Surv.*); *Chairman Try. Com.*, Coun. W. Munro.

Plymouth Corporation Tramways, Drake Circus, Plymouth. [T.N, 518, Plymouth.] *Gen. Manager and Engineer* H. P Stokes; *Chairman Try. Com.*, Ald. Sir Thos. Baker; *Vice-Chairman*, Coun. C. Harding.

Pontypridd Urban District Tramways, Generating Station, Treforest, Pontypridd. [T.N. 33.] *Gen. Manager and Elec. Eng.*, J. E. Teasdel; *Traffic Supt.*, A. Armstrong; *Per. Way Eng.*, W. E. Lowe (*Surveyor*); *Chairman Try. Com.*, Coun. H. G. Barnes.

Portsmouth Corporation Tramways, Town Hall, Portsmouth. [T.N., 4910 Corporation.] *Gen. Manager*, W. R. Spaven; *Elec. Eng., and Rolling Stock Supt.*, V. G. Lironi; *Traffic Supt.*, W. Munford; *Chairman Try. Com.*, Coun. J. Timpson, J.P. *Vice-Chairman*, Coun. E. H. Privett.

Preston Corporation Tramways, Holmrook Road, Preston. [T.A., Corporation Tramways, Preston; T.N., 273.] *Gen. Manager and Elec. Eng.*, J. F. Simpson; *Assistant Manager and Engineer*, H. Clayton; *Chairman, Try. Com.*, Ald. T. Parkinson; *Vice-Chairman*, Ald. J. Ormrod.

Radcliffe Urban District Council Tramways, Council Offices, Radcliffe, Lancs. *Res. Eng.*, H. Wilkinson; *Per. Way Eng.*, W. L. Rothwell; *Clerk*, S. Mills; *Chairman Try. Com.*, Coun. J. H. Lund.
[These tramways are worked as part of the Bury system.]

Rawtenstall Corporation Tramways, Bacup Road, Rawtenstall. [T.N., 81.] *Gen. Manager and Elec. Eng.*, C. L. E. Stewart; *Chairman Try. Com.*, Coun. H. Crabtree; *Vice-Chairman*, Ald. R. Ashworth.

Reading Corporation Tramways, Mill Lane, Reading. [T.A., Tramways Manager, Reading; T.N., 390.] *Gen. Manager & Elec. Eng.*, J. M. Calder; *Chairman Try. Com.*, Ald. C. G. Field, J.P.

Rochdale Corporation Tramways, Mellor Street, Rochdale. [T.A., Tramways, Rochdale; T.N., 48.] *Gen. Manager & Eng.*, G. Webster; *Traffic Manager*, R. Bentley; *Per. Way Eng.*, H. Yarwood; *Rolling Stock Supt.*, E. Sidgwick; *Chairman Try. Com.*, Ald. J. Taylor.

Rotherham Corporation Tramways. St. George's Hall, Rotherham. [T.A., Tramways, Rotherham; T.N., 152 and 241.] *General Manager*, T. P. Sykes; *Per. Way Eng.*, T. P. Collinge; *Traffic Supt.*, W. G. Marks; *Rolling Stock Supt.*, H. B. Sharp; *Chairman Try. Com.*, Ald. G. Gummer, J.P.; *Vice-Chairman*, Coun. Ellis.

St. Annes-on-the-Sea Council Tramways, Squires Gate, South Shore, Blackpool. [T.N., 327.] *Gen. Manager*, H. W. Laing; *Traffic Manager*, G. W. Wood; *Chairman Try. Com.*, Coun. A. E. H. Lee.

St. Helens Corporation Tramways, Hall Street, St. Helens, Lancs. *Gen. Manager*, L. C. F. Bellamy; *Chairman Try. Com.*, Coun. A. Rudd, J.P.; *Vice-Chairman* Coun. J. Hewitt.

Salford Corporation Tramways, 32, Blackfriars Street, Salford. [T.A., Tramways, Salford; T.N., 5367 and 5368 Central.] *Gen. Manager*, Geo. W. Holford; *Elec. Eng.*, J. A. Robertson; *Traffic Supt.*, J. W. Blakemore; *Per. Way Supt.*, E. B. Martin; *Rolling Stock Supt.*, R. Chadwick; *Chairman Try. Com.*, Ald. W. H. Barrett; *Vice-Chairman*, Coun. H. S. Hind.

Sheffield Corporation Tramways, 8, Division Street, Sheffield. [T.A., Tramways, Sheffield; T.N., 4600.] *General Manager*, A. R. Fearnley; *Assist. Man.*, H. Watson; *Per. Way Eng.*, W. J. Hadfield; *Rolling Stock Supt.*, J. Smith; *Chairman Try. and Motors Com.*, Ald. Sir W. E. Clegg, J.P.; *Vice-Chairman*, Ald. W. C. Fenton, J.P.

Shipley Urban District Tramway, Dockfield, Shipley. [T.A., Electricity Works, Shipley; T.N., 190.] *Elec. Eng.*, Wm Redman: *Chairman Tru. Com.*, Coun. F. F. Rhodes; *Vice-Chairman*, Coun. H. Bradley.
[Lines leased to Bradford Corporation.]

Southampton Corporation Tramways, 161, Above Bar, Southampton. [T.A., Tramways, Southampton; T.N., 301.] *Gen. Manager*, J. Dobson; *Boro. Elec. Eng.*, W. G. Turner; *Traffic Superintendent*, A. Scorey; *Chairman Try. Com.*, Ald. F. A. Dunsford, J.P.

Southend-on-Sea Corporation Tramways, London Road, Southend-on-Sea. [T.N., 96.] *Gen. Manager and Elec. Eng.*, R. Birkett; *Traffic Manager*, J. T. Fayle; *Per. Way Eng.*, R. H. Dyer (*Acting Boro. Surveyor*); *Rolling Stock Supt.*, J. Dobson; *Chairman Try. Com.*, Coun. G. Radford.

Southend Pier Electric Railway, (owned and worked by Southend-on-Sea Corporation), [T.A., Piermaster, Southend; T.N., 91.] Southend-on-Sea. *Elec. Eng.*, C. R. Norton; *Acting Piermaster*, J. C. Herbert; *Chairman*, Coun. F. Britain.

Southport Corporation Tramway, 1, Eastbank Street, Southport. [T.N., 551.] *Gen. Manager*, T. J. Kendrew: *Boro' Elec. Eng.*, Edgar Moxon; *Chairman Try. Com.*, Ald. T. S. Richardson; *Vice-Chairman*, Coun. J. Lloyd.

South Shields Corporation Tramways, Dean Road, South Shields. [T.A., Tramways, South Shields; T.N., 157.] *Gen. Manager & Elec. Eng.*, J. C. Whiteley; *Boro. Elec. Eng.*, J. Edgar; *Chairman Try. Com.*, Coun. J. G. Winskell.; *Vice-Chairman*, Coun. Stephenson

Stalybridge Hyde, Mossley, and Dukinfield Tramways and Electricity Board, Waterloo Road, Stalybridge. [T.N., 311.] *Commercial Manager*, F. Schofield; *Chief Eng.*, R. Blackmore; *Chairman Try. Com.*, Ald. R. Wood; *Vice-Chairman*, Ald. J. E. Rhodes.

Stockport Corporation Tramways, Mersey Square, Stockport. [T.N., 232 and 237.] *Manager*, A T. Eardley; *Elec. Eng.*, R. Lomax; *Chairman Try. Com.*, Coun. T. W. Potts, O.B.E.; *Vice-Chairman*, Coun. W. Merrison.

Stockton and Thornaby Corporations Joint Tramways, Bridge Road, Stockton-on-Tees. [T.A., Tramways, Stockton; T.N., 129.] *Gen. Manager*, A. Forster; *Chairman Try. Com.*, Coun. R. M. Elliott.

Sunderland Corporation Tramways, Tramway Offices, Monkwearmouth, Sunderland. [T.A., Trys. Manager, Sunderland; T.N., 948.] *Gen. Manager and Elec. Eng.*, A. R. Dayson; *Per. Way Eng.*, T. Inglis Rudman; *Chairman Try. Com.*, Ald. G. New, J.P.; *Vice-Chairman*, Ald. W. Walker, J.P.

Swindon Corporation Tramways, Electricity Works, Swindon. [T.A., Tramways Swindon T.N., 4.] *General Manager*, T. Medcalf; *Elec. and Mech. Eng.*, F. Newey; *Chairman Try. Com.*, Ald. G. H. Stevens; *Vice-Chairman*, Coun. G. Mabberley.

Tees-side Railless Traction Board, Middlesbrough Road, South Bank, Yorkshire. [T.A. Railless Board, South Bank; T.N., 31, South Bank]. *General Manager and Engineer*, J. B. Parker; *Chairman*, Councillor W. G. Grace.

Wallasey Corporation Tramways, Seaview Road, Wallasey. [T.A., Tramways, Liscard; T.N., 1431, Liscard.] *General Manager*, R. R. Greene; *Elec. Eng.*, B. T Hawkins; *Per. Way Eng.*, W. H. Travers; *Chairman Try. Com.*, Coun. S. H. Roberts.

Walsall Corporation Tramways, St. Paul's Buildings, The Bridge, Walsall. [T.A., Tramways, Walsall. T.N., 238 & 559.] *Gen. Manager and Engineer* Chas. Burgess; *Chief Assistant*, J. R. Taylor; *Rolling Stock Supt.*, M. J. Somerfield; *Chairman, Try. Com.*, Ald. J. Cope; *Vice-Chairman*, Ald. J. Williams.

Walthamstow Urban District Council Tramways, Chingford Road, Walthamstow, [T.A., Tramways, Walthamstow; T.N., 20.] *Tramways Manager*, W. Murray; *Elec. Eng.*, G. R. Spurr (Priory Avenue, Walthamstow); *Per. Way Eng.*, G. W. Holmes; *Chairman Trys. Com.*, Coun. B. Clarkin.

Warrington Corporation Tramways, Mersey Street, Warrington. [T.N., 196] *Gen. Manager*, J. Telfer; *Elec. Eng.*, F. V. L. Mathias; *Chairman Try. Com.*, Ald. Sir. P. Peacock. J P.; *Vice-Chairman*. Ald. J. Wilkinson.

West Bromwich Corporation Tramway, Electricity Works, West Bromwich. [T.N., 100.] *Boro. Eng.*, A. D. Greatorex; *Boro. Elec. Eng.*, W. A. Jackson; *Chairman Highways Com.*, Ald. A. G. Turley, J.P.; *Vice-Chairman*, Coun. Wheatley.
[These tramways are leased to the South Staffs. (Lessee) Co., Ltd.]

West Ham Corporation Tramways, Greengate Street, Plaistow, London, E. [T.A., Trameurs, Plais., London; T.N., 862 and 868 East.] *General Manager*, L. Slattery; *Boro' Elec. Eng.*, F. W. Purse; *Chairman Try. Com.*, Coun. Husband.

West Hartlepool Corporation Tramways, Cleveland Road, West Hartlepool. [T.N., 6073.] *Gen. Manager and Eng.*, T. G. Richardson; *Chairman Try. Com.*, Ald. Martin; *Vice-Chairman*, Coun. Turnbull.

Wigan Corporation Tramways, Market Place, Wigan; [T.N., 226.] *General Manager and Eng.*, W. M. Milnes; *Rolling Stock Supt.*, J. H. Birch; *Per. Way Eng.*, R. B. Donald; *Chairman Try. Com.*, Ald. R. T. Fletcher. *Vice-Chairman*, Coun. J. Walkden.

Wolverhampton Corporation Tramways, Municipal Tramway Offices, Cleveland Road, Wolverhampton. [T.N., 324.] *Gen. Manager and Engineer*; C. O. Silvers; *Boro. Elec. Eng.*, S. T. Allen; *Per. Way Eng.*, George Green; *Chairman Try. Com.*, Ald. Sir S. Craddock; *Vice-Chairman*, Coun. Davies.

Yarmouth Corporation Tramways (See Great Yarmouth Corporation Tramways).

York Corporation Tramways, 8, Clifford Street, York. [T.N., 302]. *Gen. Manager and Elec. Eng.*, J. W. Hame; *Traffic Supt.*, J. W. Horton; *Per. Way Eng.*, F. W. Spurr (City Surveyor); *Chairman Try. Com.*, Ald. C. W. Snipley; *Vice-Chairman*, Coun. J. G. Gibbs.

COMPANY TRAMWAYS

Aberdeen Suburban Tramways Company, 15, Golden Square, Aberdeen. [T.A., Judicial, Aberdeen; T.N., 2583.] *Manager & Per. Way Eng.*, A. Wilkie; *Sec.*, G. Duncan; *Chairman*, James Mearns; *Directors*, Dr. W. Christie, Jas. Sellar.

Airdrie and Coatbridge Tramways Company, Tramway Depôt, Main Street, Coatbridge [T.N., 105], and Electrical Federation Offices, Kingsway, London, W.C. *Gen. Manager*, A. Robertson; *Sec.*, S. J. Rowe; *Chairman*, W. L. Madgen; *Directors*, H. S. Day, G. J. Somerville, P. N. Gray.

Barnsley and District Electric Traction Company, Ltd., Car Depot, Sheffield Road, Barnsley [T.A., Tramways, Barnsley; T.N., 159.], and Electrical Federation Offices, Kingsway, W.C. *General Manager*, W. E. Nicoll; *Sec.*, S. M. Wright; *Chairman*, E. Garcke; *Directors*, Col. Sir Thomas Pilkington, Bart., E. A. Paris, P. N. Gray, L. M Myers.

Barrow-in-Furness Tramways, Salthouse Road Depot, Barrow.
[These Tramways have been purchased, and are now worked by Barrow-in-Furness Corporation.]

Bath Electric Tramways Company, Ltd., 10, Northgate Street, Bath, and 119-125, Finsbury Pavement, London, E.C. [T.A., Trams, Bath; T.N., 1214.] *Gen. Manager and Eng.*, W. E. Hardy; *Traffic Supt.*, —; *Sec.*, H. J. Almond; *Chairman*, J. B. Hamilton; *Directors*, H. F. Clutterbuck. E. H. R. Trenow, A. A. C. Swinton.

Bessbrook and Newry Tramway Company, Bessbrook, Co. Armagh. [T.A., Tramway, Bessbrook.] *Manager*, R. Hamilton; *Chief Eng.*, J. L. D. Meares; *Chairman*, J. N. Richardson; *Directors*, C. H. Richardson, R. T. Scott, T. W. Richardson, J. M'Gregor Greer.

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ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Birmingham District Power and Traction Company, Power Station, Downing Street, Smethwick, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Power Station, Smethwick; T.N., 65 Smethwick.] *Gen. Manager*, W. G. Bond; *Secretary*, B. Kingsford; *Chairman*, C. Shirreff Hilton; *Directors*, J. A. Lycett, W. L. Madgen, S. R. Blundstone, R. J. Howley.

Blackpool and Fleetwood Tramroad. [This Tramway is now owned and worked by Blackpool Corporation.]

Blackpool and Fylde Light Railway Company, 5, Clifton Street, Blackpool. (No appointment of engineer or officials yet made.) *Secretary*, R. Bibby; *Chairman*, John Greenwood; *Directors*, T. Fisher, J.P., John Platt, J.P., W. Hardman, J.P., R. H. Mabbott.

Brighton Beach Electric Railway, Madeira Road, Brighton. [T.A., Volk, Brighton; T.N., 14 P.O.] *Manager and Eng.*, Magnus Volk; *Traffic Superintendent*, Miss Barton; *Per. Way Eng.*, J. Barker; *Secretary*, A. Volk; *Chairman*, Magnus Volk; *Directors*, M. H. Volk, B. W. Symonds, A. Volk.

Bristol Tramways and Carriage Company, Ltd., Clare Street House, Bristol. [T.A., Cab, Bristol; T.N., 74 & 3074 Nat.] *Manager*, Colonel S. E. Smith; *Assist. Manager*, W. H. Stradling; *Electrical Engineer*, W. Nairn; *Permanent Way Engineer*, G. T. C. Edwards; *Secretary*, H. F. Cooper; *Chairman*, S. White, J.P.; *Directors*, W. G. Verdon Smith (*Managing*), J. H. Howell, J.P., Sir G. Stanley White, Bart., S. E. Baker, Chas. Challenger.

British Electric Traction Company, Ltd., Electrical Federation Offices, Kingsway, London, W.C. J. S. Austen (*chairman*); *Directors*, E. Garcke (*Dep. Chairman*), C. Shirreff Hilton, W. L. Madgen, Sir E. C. K. Ollivant, A. Shepherd, C. G. Tegetmeier, P. D. Tuckett, *Manager*, C. H. Dade; *Secretary*, T. Bower; *Accountant*, C. Walmsley.

This company is interested in the following tramways, particulars of which are given under their respective names:

Airdrie & Coatbridge.
Barnsley & District.
Birmingham & District Power & Traction Co.:
Dudley, Stourbridge, & District.
South Staffordshire.
Wolverhampton Dist.
Gateshead & District.
General Elec. Tramways.
Gravesend & Northfleet.
Greenock & Port Glasgow.
Jarrow & District.
Kidderminster & District.
London and Suburban Traction Co.
Merthyr.
Middleton.
Peterborough.
Potteries.
Rotherham.
Sheerness & District.
Swansea.
Taunton.
Tynemouth & District.
Weston-super-Mare & District.
Worcester.
Wrexham & District.
Yorkshire (Woollen Dist.)

Burton and Ashby Light Railway, Power Station, Swadlincote, nr. Burton-on-Trent. [T.A., Toulmin, Swadlincote; T.N., 1.] *Manager and Eng.*, Jas. Toulmin; *Secretary*, W. N. Bancroft; *Chairman*, G. Murray Smith.

[The line is owned and worked by the Midland Railway Company.]

Camborne and Redruth Tramways, Elec. Works, Carn Brea, R.S.O., Cornwall. [T.N., 3, Camborne.] (Owned by Urban Elec. Supply Co.) *Manager and Eng.*, L. A. Hards: *Sec.*, C. H. Jones; *Chairman*, P. D. Tuckett; *Directors*, E. Charrington, H. B. Grotian, Sir Douglas Owen.

Carlisle Tramways Company, Ltd., City of, Depot and Offices, London Road, Carlisle. [T.A., Tramways, Carlisle; T.N., 0180.] *Engineer and Manager*, E. W. Sleight.

Chatham and District Light Railways Company, Luton Road, Chatham, and 83, Cannon Street London, E.C. [T.A., Tramways, Chatham; T.N., 51.] *General Manager*, W. Jensen; *Assist. Manager*, A. J. Bousfield; *Secretary*, A. Clements; *Chairman*, A. R. Monks; *Directors*, H. C. Levis, J. F. Nauheim, W. B. H. Martindale.

Cheltenham and District Light Railway Company, Cheltenham. [T.N., 341.] *Chairman*, A. R. Holland; *Directors*, A. H. Beatty, W. Shearer, H. L. Williams, H. J. McCormick; *Sec.*, Wm. C. Bryden, C.A., 66, Queen Street, London, E.C.; *Local Eng. and Manager*, Henry J. McCormick, Dalkeith, Gloucester Road, Cheltenham.

Clontarf and Hill of Howth Tramroad Company, 39, Dame Street, Dublin. [T.A., c/o Railways, Dublin; T.N., 917.] *Secretary*, T. Pollock; *Chairman*, W. L. Murphy; *Directors*, E. Anderson, J. J. Dudley.

Cork Electric Tramways and Lighting Company, Ltd., Albert Street, Cork [T.A., Tramways, Cork; T.N., 78 and 535.], and 83, Cannon Street, London, E.C. *Manager and Engineer*, H. H. Nalder; *Traffic Manager*, H. G. Whiting; *Per. Way Engineer*, H. Mack; *Secretary*, A. Clements; *Chairman*, A. R. Monks; *Directors*, E. Anderson, Maj. W. Martindale, H. C. Levis, Dr. W. L. Murphy, A. H. Walton.

Dartford Urban District Council Light Railways. Car Depot, Priory Road, Dartford. [T.N., 31 Dartford.] (Leased to and worked by Bexley Urban District Council, Broadway, Bexleyheath, Kent).

Devonport and District Tramways Company, Electrical Federation Offices, Kingsway, London, W.C. *Secretary*, S. M. Wright; *Acting Sec.*, P. N. Gray; *Chairman*, C. S. B. Hilton; *Directors*, J. S. Raworth, E. R. Soames, C. G. Tegetmeier, R. J. Sutcliffe.

[This Company's undertaking has been sold to Plymouth Corporation.]

Dewsbury, Batley, and Birstall Tramways Company, Ltd., Electrical Federation Offices, Kingsway, London, W.C.

[Lines worked by Yorkshire (Woollen District) Electric Tramways, Ltd., *q.v.*]

Dewsbury and Ossett Corporation and Soothill Nether Urban District Council Tramways, (Lessees: The National Elec. Construction Co., Ltd., 62 and 63, Queen Street, London, E.C.) [T.A., Overhauled, London; T.N., 6616 and 6617 City.] *Manager*, W. McGibbon.

Douglas—Ramsey. (The Manx Elec. Rly. Company), 1, Strathallan Crescent, Douglas. (See Manx Electric Railway Company).

Douglas Southern Electric Tramways, Ltd., Marine Drive, Douglas, Isle of Man, and 24, Brazennose Street, Manchester. [T.A., Traffic, Douglas.] *Manager and Eng.*, R. Orton; *Sec.*, E. A. Sharples; *Chairman*, T. J. Hutchinson; *Directors*, I. E. Winslow, E. A. Hopkins, W. R. Hart.

Dublin and Lucan Electric Railway Company, 15, Conyngham Road, Dublin. [T.A., Lucan Tramway, Dublin; T.N. 2282, 4005 and 4006 Dublin, and 5 Lucan.] *Manager, Elec. Eng., and Sec.*, D. McDowall Grosart, J.P.; *Chairman*, J. W. Hill, J.P.; *Directors*, E. Anderson, J.P., A. B. Coyle, J.P., G. V. Murphy, J. R. Dillon.

Dublin United Tramways Company (1896), Ltd., 9, Upper Sackville Street, Dublin. [T.A., Tramways, Dublin; T.N., 58 and 59.] *Gen. Manager*, G. Marshall Harriss; *Elec. Eng.*, R. Tanham; *Con. Eng.*, H. F. Parshall; *Per. Way Eng.*, P. F. O'Sullivan; *Secretary*, ————; *Chairman*, Rt. Hon. L. A. Waldron, P.C.; *Directors*, Joseph Mooney, J.P., William Hewat, Capt. Wm. L. Murphy.

Dudley, Stourbridge and District Electric Traction Company, Ltd. (Section of The Birmingham and Midland Tramways Joint Committee), Power Station, Downing Street, Smethwick, Brierley Hill, Staffs., and Electrical Federation Offices, Kingsway, London, W.C. [T.N., 65 Smethwick.] *General Manager*, W. G. Bond; *Acting Secretary*, L. Eardley; *Chairman*, S. R. Blundstone: *Directors*, J. A. Lycett, J. V. Kitchener, B. Kingsford.

Dumbarton Burgh and County Tramways Company, Tramway Depot, Dumbarton, and 23, Rutland Street, Edinburgh. [T.A., Tramways, Dumbarton; T.N., 119.] *Gen. Manager and Elec. Eng.*, J. P. McMahon; *Secretary*, A. Dishart; *Chairman*, G. Balfour; *Directors*, K. Sanderson, K. A. Scott Moncrieff.

Dundee, Broughty Ferry & District Tramways Company, Milton, Monifieth, N.B. [T.N., 24 Monifieth.] *Gen. Manager and Engineer*, George Brander; *Secretary*, E. Cowan; *Chairman*, George Balfour; *Directors*, Edward Cowan, David Hynd.

Dunfermline and District Tramways Company, Tramway Depot, Cowdenbeath, Fife, and 8, New Row, Dunfermline. *Manager and Engineer*, J. H. Shepherd; *Secretary*, G. A. Nicolson; *Cons. Engs.*, Hawtayne & Zeden; *Chairman*, Wm. Low; *Directors*, G. Balfour (*managing*), K. Sanderson, D. Hynd.

Falkirk & District Tramways Company, Larbert Road, Larbert, Stirlingshire. [T.A., Tramways Co., Falkirk; T.N., 154 Falkirk.] *Gen. Manager and Engineer*, D. Hays; *Chairman*, G. M. Brown; *Directors*, A. W. Tait, R. Hunter, G. Balfour, H. Brown.

Felixstowe Pier Railway, Felixstowe. (The Coast Development Corporation, Ltd.) *Elec. Eng.*, E. A. Lambert.

Gateshead and District Tramways Company, Tramway Depôt, Sunderland Road, Gateshead, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramway Depôt, Gateshead; T.N., 125 & 408 Gateshead.] *General Manager*, William Morrison; *Secretary*, J. Young; *Chairman*, H. S. Day; *Directors*, H. A. Stagg, C. R. Greene, J.P., Judge L. A. Atherley-Jones, K.C., G. J. Somerville.

Giant's Causeway and Portrush Electric Tramway Company, Portrush. *Manager & Sec.*, W. McCurdy; *Elec. Eng.*, W. A. Traill; *Chairman*, J. S. Moore; *Directors*, A. B. Stuart, W. A. Traill.

Glossop Tramways, Electricity Works, Glossop (owned by the Urban Electric Supply Co.) [T.N., 31, Glossop.] *Manager and Res. Eng.*, C. E. Knowles; *Rolling Stock Supt.*, T. L. Podmore; *Secretary*, C. H. Jones; *Chairman*, P. D. Tuckett; *Directors*, E. Charrington, F. E. Gripper, H. B. Grotrian, D. Owen.

Gosport and Fareham Tramways, Tramways and Lighting Office, Gosport, Hants., and Moorgate Station Chambers, London, E.C. [T.A., Tramways, Gosport; T.N., 3, Post Office, Gosport.] *Eng. and Manager*, J. Fereday Glenn; *Sec.*, J. Barber Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Directors*, J. Barber Glenn (*managing*), S. Hern.

Gravesend & Northfleet Electric Tramways, Ltd., Tramway Depot, Northfleet, Kent, and Electrical Federation Offices, Kingsway, London, W.C. [T.N., 258, Gravesend.] *Manager*, P. R. Blake; *Sec.*, S. M. Wright; *Chairman*, E. Garcke; *Directors*, W. L. Madgen, P. N. Gray, S. E. Garcke.

Great Crosby Tramways, 31, James Street, Liverpool.

[This tramway is worked by the Liverpool Overhead Railway Company.]

Great Grimsby Street Tramway Co., Southampton House, Cleethorpes, and Moorgate Station Chambers, London, E.C. [T.A., Blanco, Cleethorpes; T.N., 16.] *Manager and Eng.*, H. L. White; *Elec. Eng.*, H. O. White; *Managing Director and Secretary*, J. B. Glenn; *Chairman*, A. Beattie, J.P., D.L.; *Director*, S. Hern

Greenock and Port Glasgow Tramways Company, Ladyburn, Greenock, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramways, Greenock; T.N., 562]. *Manager*, A. Robertson; *Secretary*, S. J. Rowe; *Chairman*, W. L. Madgen; *Directors*, G. J. Somerville, P. N. Gray H. S. Day.

Guernsey Railway Company, Ltd., Hougue-a-la-Perre, Guernsey. *Manager and Elec. Eng.*, Arthur G. Bird; *Sec.*, J. de Mouilpied; *Chairman*, G. F. Peek; *Directors*, W. D. Murdoch, J. B. Collings, Q. Le Pelley, T. W. Palmer.

Hampshire Light Railway (Electric) Company, Ltd., Moorgate Station Chambers, London, E.C. *Secretary*, J. B. Glenn; *Chairman*, A. Beattie, J.P.; *Directors*, J. Barber Glenn (*managing*), S. Hern.

[This company works the Portsdown and Horndean Light Railway.]

Hastings Tramways Company, Ltd., Beaufort Road, Silverhill, St. Leonards-on-Sea, and 1, Queen Victoria Street, London, E.C. [T.A., Tramways, Hastings, and Enshrine, London; T.N., 90 Hastings, and 3465, City]. *General Manager and Elec. Eng.*, W. Vincent Edwards; *Secretary*, W. R. Elston; *Chairman*, G. Kitchin; *Directors*, J. C. Williamson, Dr. Moody.

Imperial Tramways Company, Ltd., Clare Street House, Bristol. *Secretary*, F. H. Withers; *Manager*, F. Freshwater; *Chairman*, S. White, J.P.; *Directors*, W. G. Verdon Smith (*Managing*), J. H. Howell, Sir G. Stanley White, Bart.

Isle of Thanet Electric Tramways and Lighting Company, Ltd., St. Peter's, Kent, and Moorgate Station Chambers, London, E.C. [T.A., Tramways, St Peters, Kent; T.N., 29 Broadstairs]. *Gen. Manager and Elec. Eng.*, J. A. Forde; *Traffic Supt.*, A. L. Gardener; *Secretary*, J. Barber Glenn; *Chairman*, A. R. Monks; *Directors*, Marquess of Ormonde, J. B. Glenn, H. Brown.

Jarrow and District Electric Traction Company, Ltd., Electrical Federation Offices, Kingsway, London, W.C. [T.A., Jarrow, c/o Tramway, London; T.N., 1220 Holborn.] *Traffic Manager*, G. McClelland; *Secretary*, J. Young; *Chairman*, G. J. Somerville; *Directors*, W. Morrison, H. S. Day, H. A. Stagg.

Kidderminster & District Electric Lighting and Traction Co., Ltd., Kidderminster, and Electrical Federation Offices, Kingsway, London, W.C. [T.N., 108]. *General Manager*, W. G. Bond; *Secretary*, B. Kingsford: *Chairman*, E. Garcke *Directors*, J. A. Lycett, H. S. Day, W. L. Madgen.

Kinver Tramway, Kinver, and Electrical Federation Offices, Kingsway, London, W.C., *q.v.*, Dudley, Stourbridge, and District Elec. Traction Co., Ltd.

Lanarkshire Tramways Company, Edinburgh Road, Motherwell, N.B., and 83, Cannon Street, London, E.C. [T.A., Tramways, Motherwell; T.N., 64.] *Gen. Manager and Eng.*, G. F. Moller; *Elec. Eng.*, E. H. Glennie; *Per. Way Eng.*, R. Foster; *Traffic Supt.*, J. L. White; *Sec.*, A. Clements: *Chairman*, A. R. Monks; *Directors*, Lord Carmichael, Sir B. Cunard, Bart., H. C. Levis, J. F. Nauheim

Lancashire United Tramways Limited, Atherton, Lancs. [T.A., Tramways, Atherton; T.N., 36, Atherton.] *Gen. Manager and Engineer*, E. H. Edwardes; *Secretary*, J. R. Holt; *Chairman*, Hon. Sir A. Stanley, G.B.E.; *Directors*, J. M. Henderson, J.P., R. Watson, J.P., A. Adam, J. S. Austen.

Liverpool and Prescot Light Railway.—This line, which with the St. Helens Corporation Tramways forms the connecting link between the City of Liverpool and South Lancashire Tramways, is owned and worked by the Liverpool Corporation.

Liverpool Overhead Railway Company, 31, James Street, Liverpool. [T.A., Motor, Liverpool; T.N., 5463 Central.] *Gen. Manager and Eng.*, E. J. Neachell; *Secretary*, H. G. Alexander; *Chairman*, H. C. Woodward; *Directors*, H. Sutton Timmis, G. D. Killey, J. U. Hodgson, M. H. Maxwell.

Llandudno and Colwyn Bay Electric Railway, Limited, Tramway Depôt, Rhôs-on-Sea, Colwyn Bay, and Basildon House, Moorgate Street, London, E.C. *Gen. Manager*, Alex. G. Balfour; *Secretary*, A. W. R. Lovering; *Chairman*, A. W. Tait; *Directors*, G. Balfour, Col. A. E. Williams.

Llanelly and District Electric Lighting and Traction Company, Ltd., Llanelly, and 66, Queen Street, London, E.C. *Engineer and Manager*, J. E. Stewart; *Secretary*, W. C. Bryden; *Chairman*, A. R. Holland; *Directors*, M. A. Edwards, A. H. Beatty.

London and Suburban Traction Company, Ltd., Electric Railway House, Broadway, Westminster, London, S.W. *Manager*, C. J. Spencer; *Secretary*, A. L. Barber; *Chairman*, Lord Ashfield; *Deputy-Chairman*, Lord Stuart of Wortley; *Directors*, C. G. Tegetmeier, W. M. Acworth, E. Garcke, E. R. Soames, Sir James Devonshire, K.B.E. (*managing*).

London United Tramways Ltd., Electric Railway House, Broadway, Westminster, London, S.W.1. [T.N., 6800, Victoria.] *Gen. Manager*, C. J. Spencer; *Deputy Manager and Engineer*, A. V. Mason; *Traffic Supt.*, J. B. Mackinnon; *Secretary*, A. L. Barber; *Asst. Secretary*, E. Boys; *Chairman*, Sir W. M. Acworth; *Directors*, George Balfour, M.P., Sir Lewis Coward, K.C., Sir James Devonshire, K.B.E., C. G. Tegetmeier, H. A. Vernet.

Luton Corporation Tramways (leased to and worked by Balfour, Beatty & Co., Ltd., 66, Queen Street, London, E.C.), Tramway Offices, Park Street, Luton. [T.N., 230.] *Engineer and Manager*, William W. Clark.

Mansfield & District Light Railway Co., Sutton Road, Mansfield, and 66, Queen Street, London, E.C. [T.A., Cars, Mansfield, T.N., 107.] *Eng. and Manager*, R. F. Dixon; *Secretary*, W. C. Bryden; *Chairman*, A. R. Holland; *Directors*, W. J. Chadburn, A. H. Beatty, G. Balfour.

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ELECTRIC TRAMWAYS IN THE UNITED KINGDOM

Manx Electric Railway Company, Ltd., 1, Strathallan Crescent, Douglas, Isle of Man, and 3, Finch Lane, London, E.C. [T.A., Electric, Douglas, Man.; T.N., 61.] *Gen. Manager & Eng.*, F. Edmondson; *Secretary*, A. D. Foster; *Chairman*, Sir W. H. Vaudrey; *Directors*, Sir B. E. Greenwell, E. Remnant, C. A. Huni.

Merthyr Electric Traction and Lighting Company, Ltd., 53, Pontmorlais Circus, Merthyr, and Electrical Federation Offices, Kingsway, London, W.C. [T.A., Tramway Company, Merthyr; T.N., 0180, Merthyr Tydfil.] *Managing Eng.*, L. W. Dixon; *Secretary*, F. J. Cursons; *Chairman*, G. J. Somerville; *Directors*, C. G. Tegetmeier, W. L. Madgen, E. R. Soames.

Metropolitan Electric Tramways, Limited, Electric Railway House, Broadway, Westminster, London, S.W. [T.A., Metrolito, London; T.N., 6800, Victoria.] Manor House Offices, Seven Sisters Road, N. [T.A., Lentiscus, London; T.N., 77 Tottenham.] *Gen. Manager*, C. J. Spencer; *Deputy Manager and Engineer*, A. V. Mason; *Traffic Supt.*, J. B. Mackinnon; *Secretary*, A. L. Barber; *Asst. Secretary*, E. Boys; *Chairman*, E. Garcke; *Directors*, Sir William Acworth, Sir James Devonshire, K.B.E., W. L. Madgen, C. G. Tegetmeier.

Mexborough and Swinton Tramways Company, Electricity Works, Rawmarsh, Yorks. [T.N., 266], and 62 and 63, Queen Street, London, E.C. *Manager and Eng.*, W. McGibbon; *Consulting Elec. Eng.*, F. E. Stanley; *Assistant Engineer*, A. A. Davis; *Traffic Supt.*, M. McLeod; *Secretary*, L. D. H. Jacobs; *Chairman*, ———; *Directors*, W. B. Cownie, C.A. (*Managing*), J. T. Jervis, Ald. D. L. Winter.

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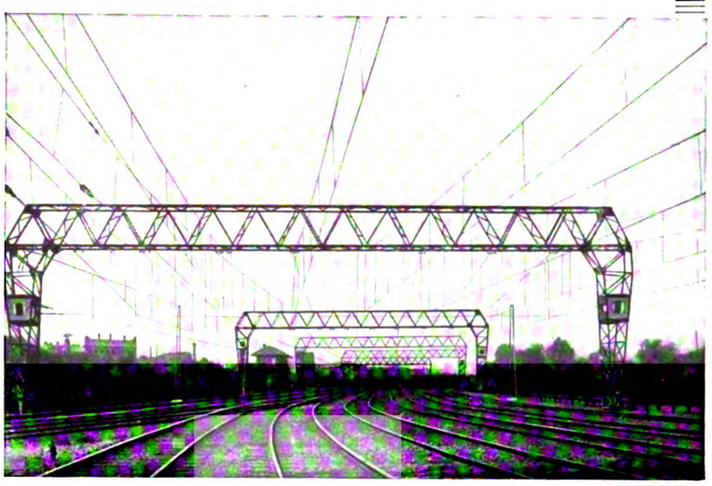

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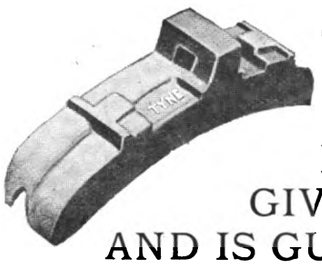

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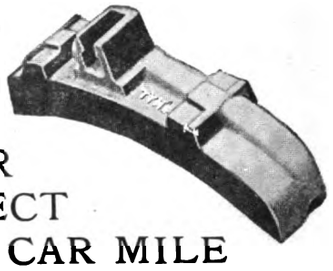

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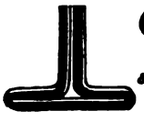

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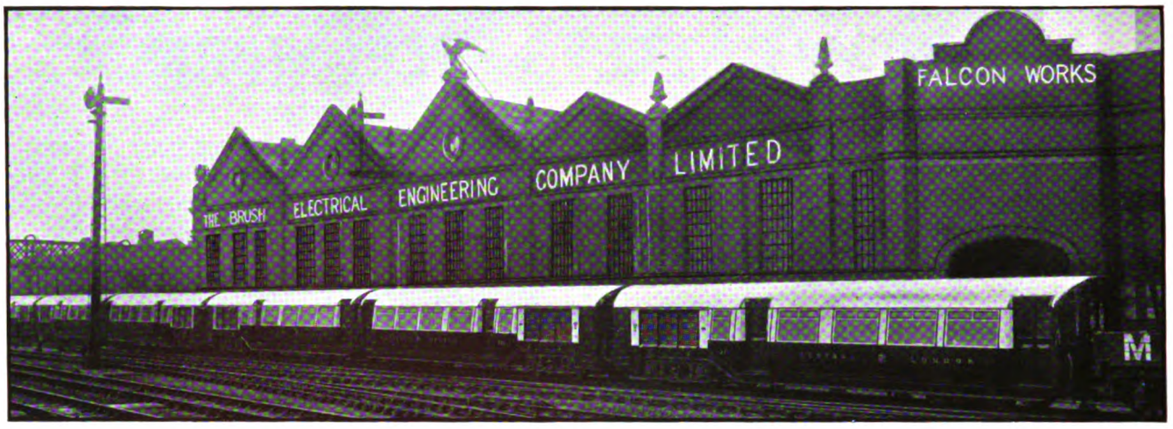

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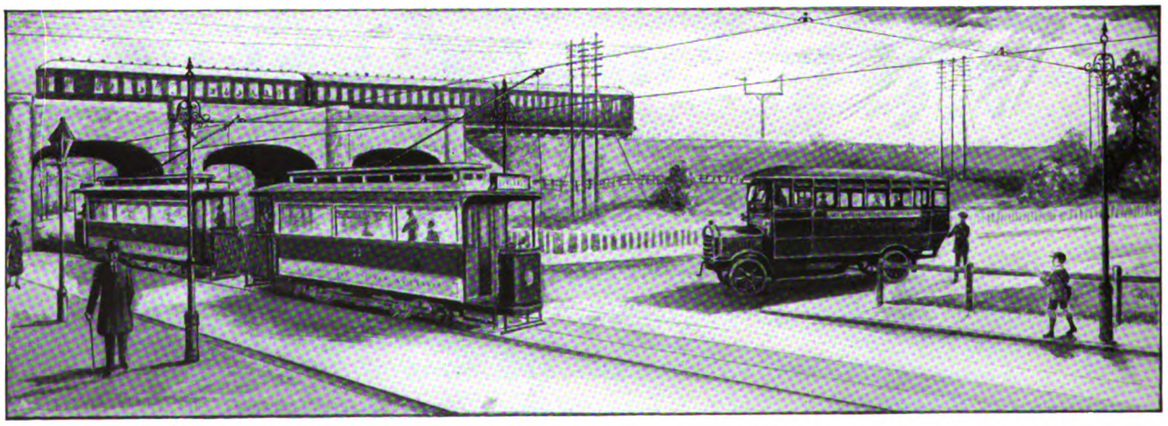

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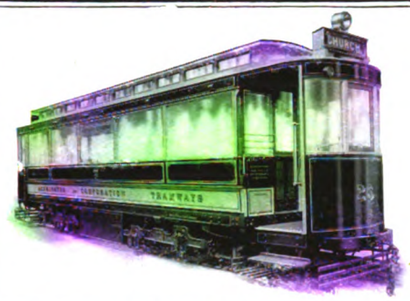

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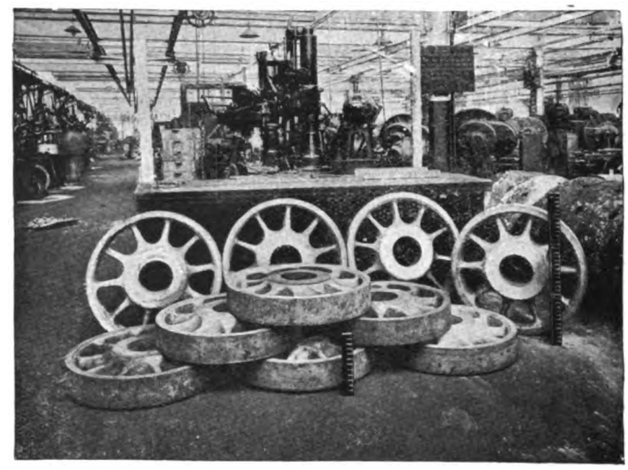

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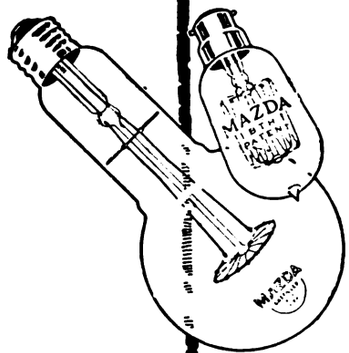

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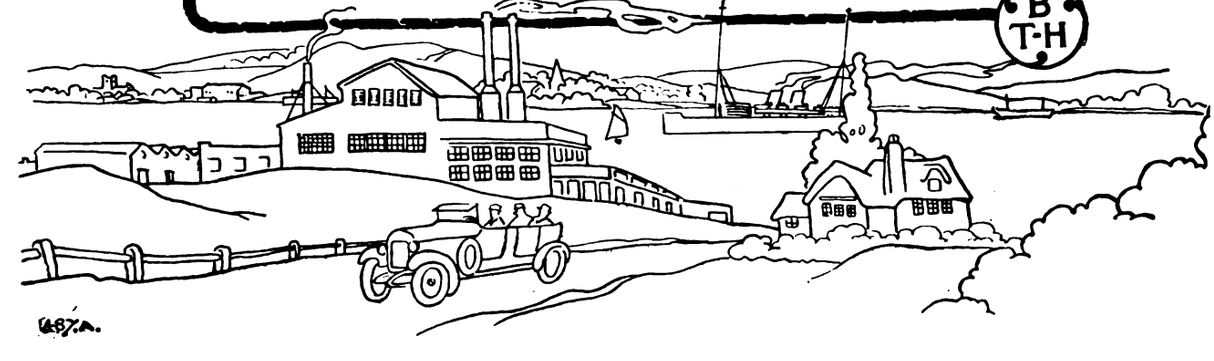

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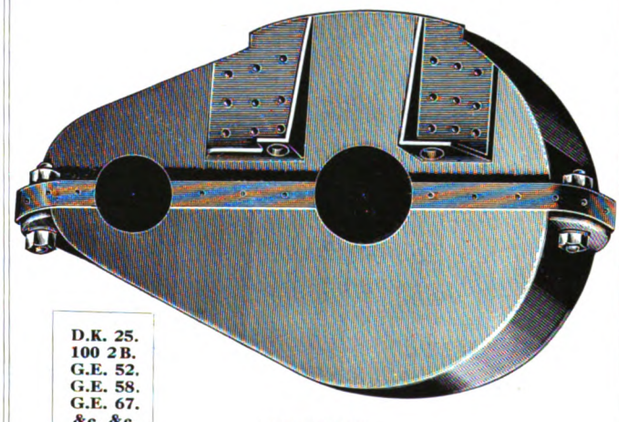

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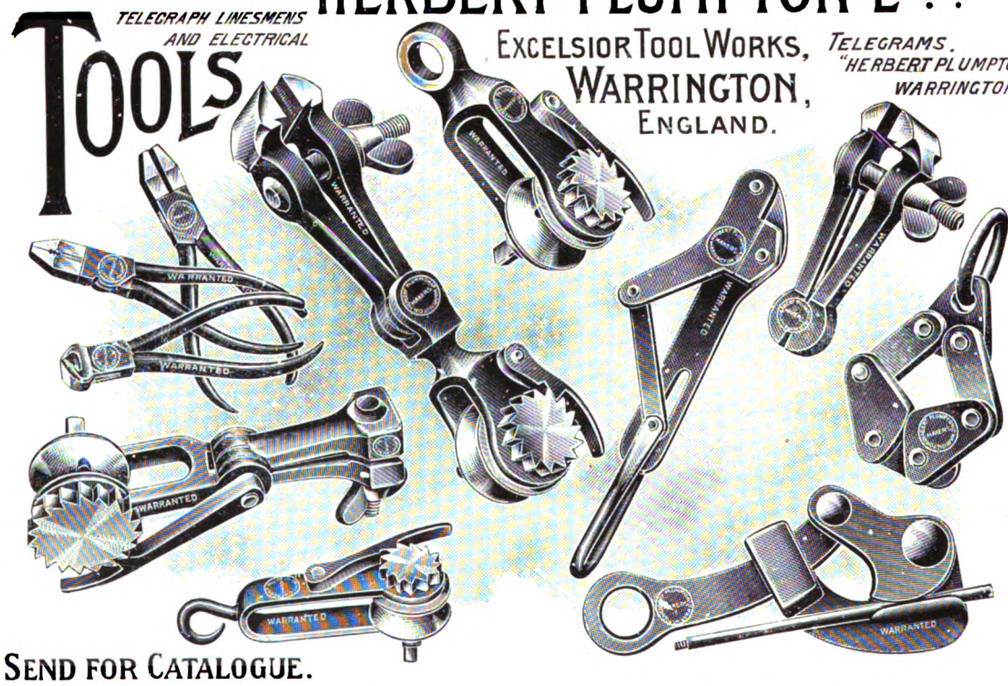

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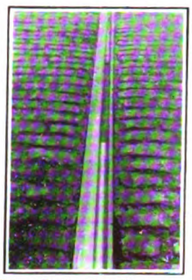

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Money Saved

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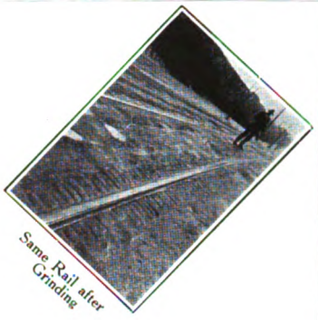

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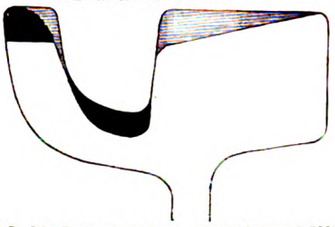

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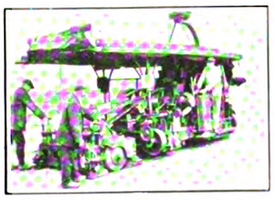

Rail Grinding Machine at Work

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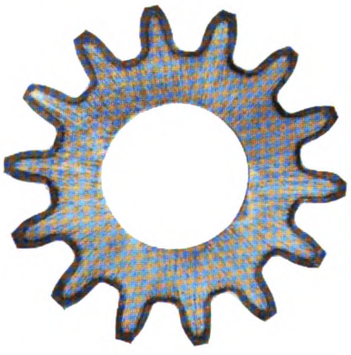

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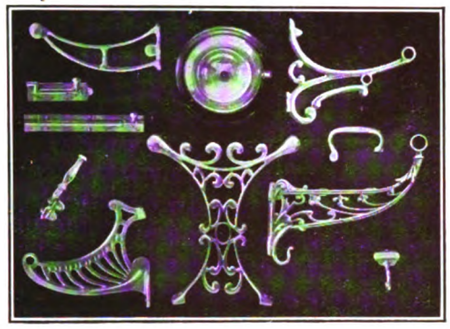

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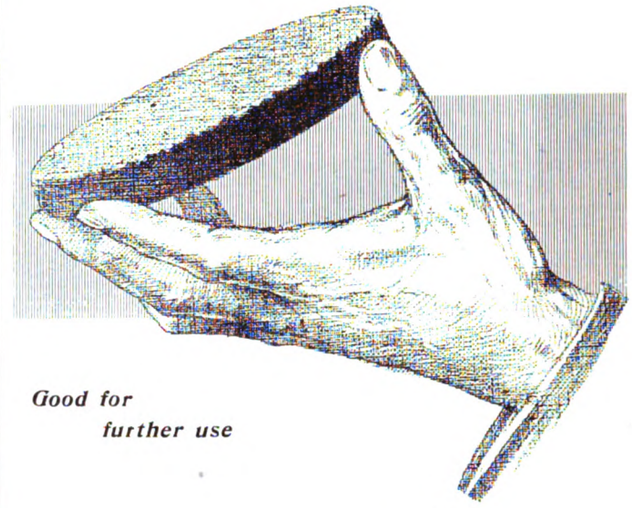

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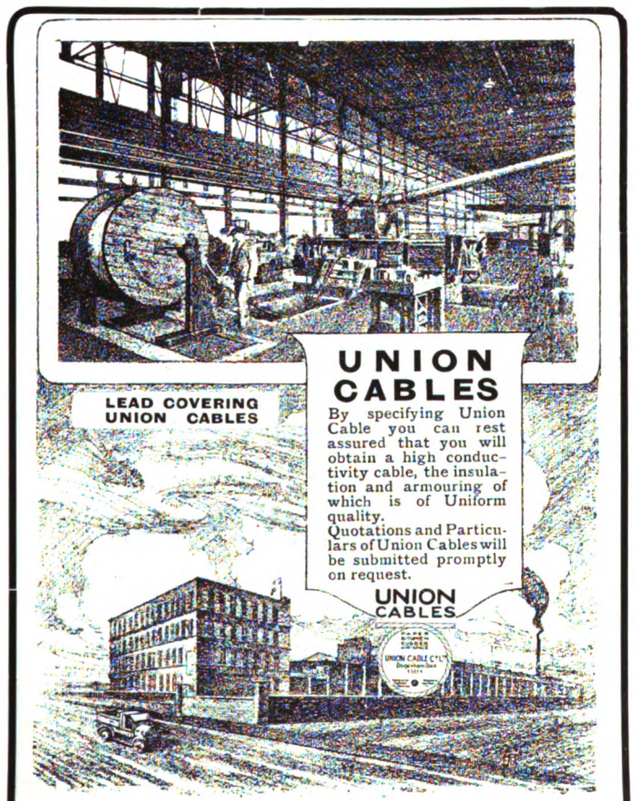

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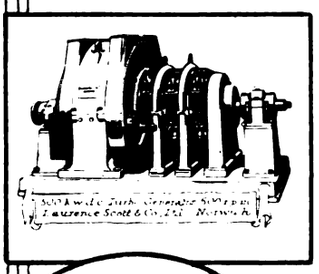

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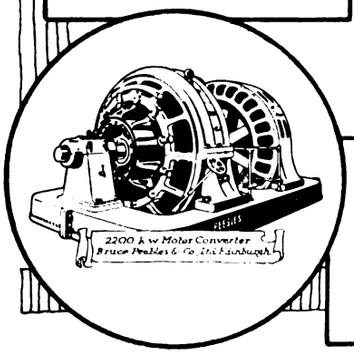

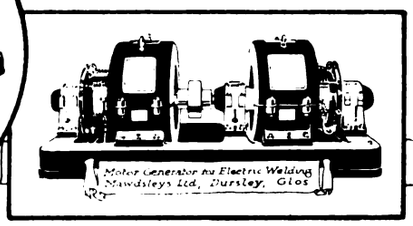

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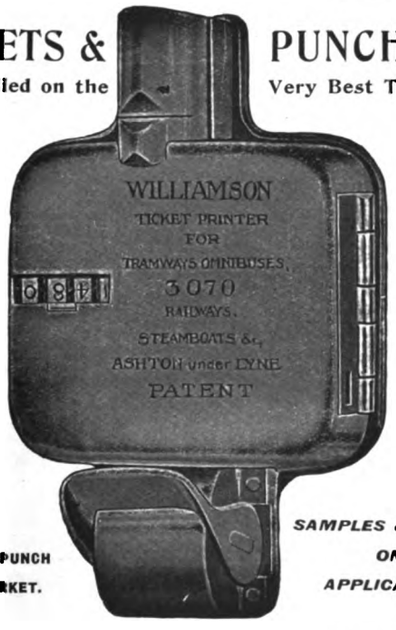

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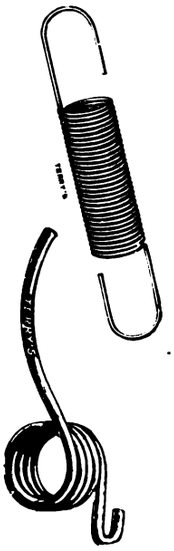

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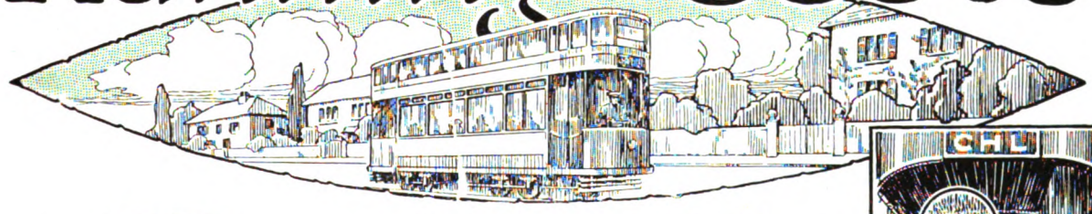

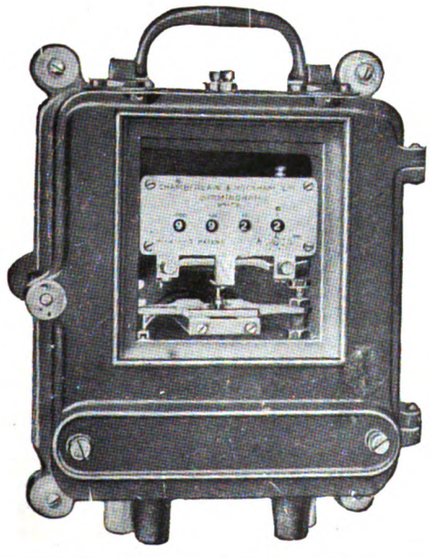

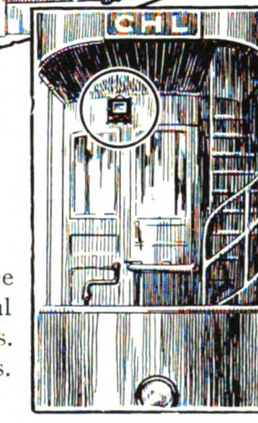

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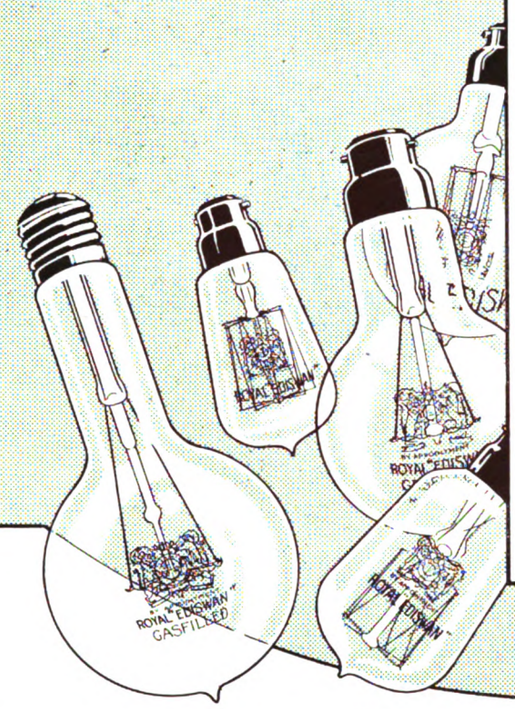

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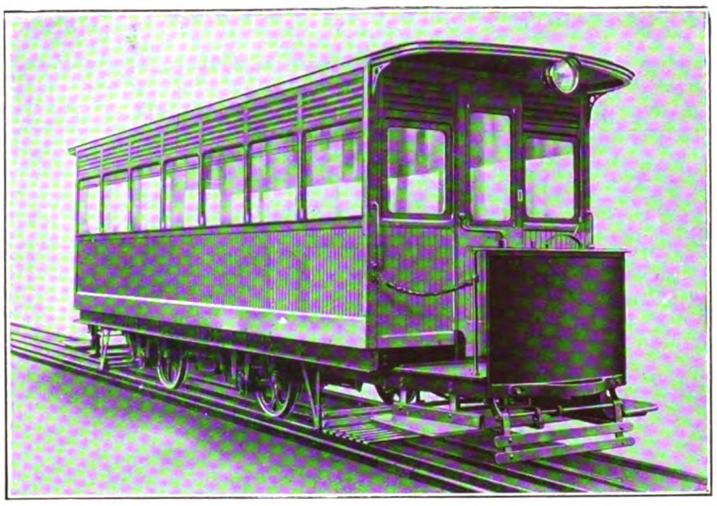

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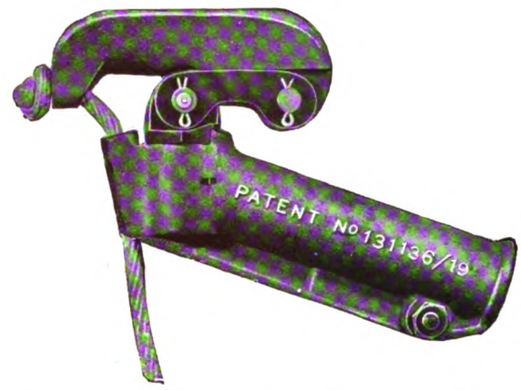

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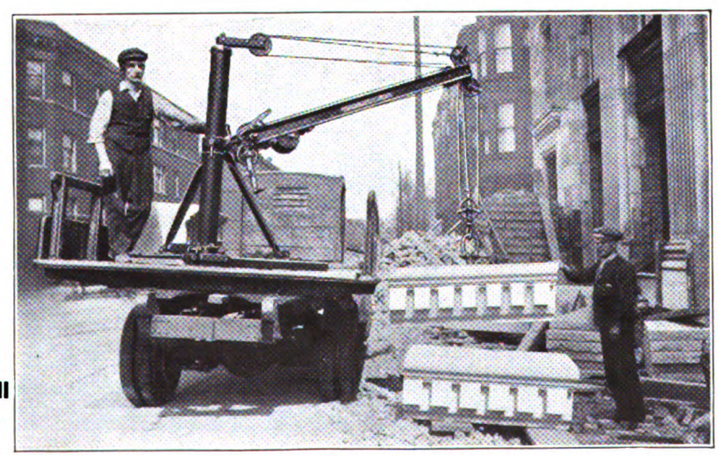

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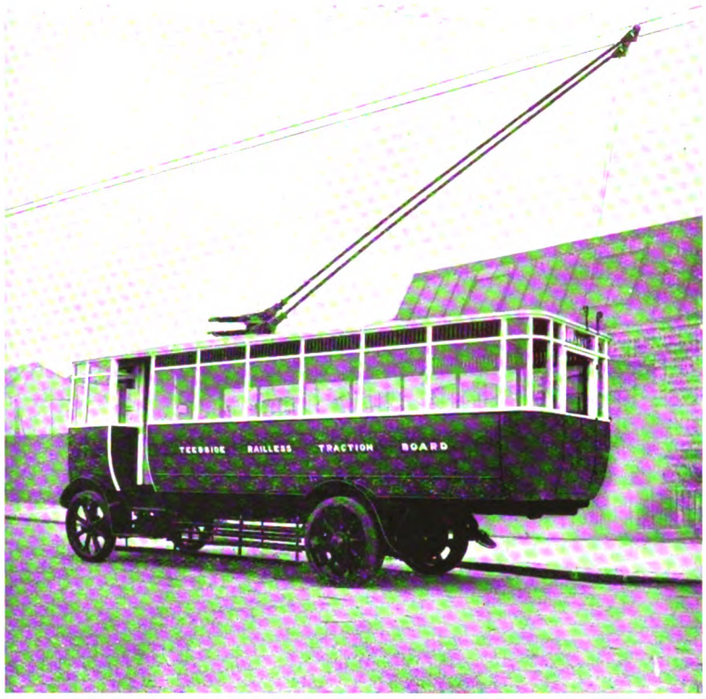

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Dundee, Broughty Ferry & District Tramways.
Barrow-in-Furness Corporation Tramways.
Maidstone Corporation Tramways.
Yorkshire (West Riding) Electric Tramways Co., Ltd.
Croydon Corporation Tramways.
Dundee Corporation Tramways and Omnibuses.
Stockton and Thornaby Corporation Tramways.
Stockton Corporation Omnibuses.
St. Helens Corporation Tramways.

HIGHEST RENTS PAID FOR SOLE RIGHTS OF ADVERTISING

ON ANY SYSTEM OF TRAMWAYS OR OMNIBUSES

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Electric Shunting Locomotives

require

less fuel and less maintenance

than steam locomotives

THE British Thomson-Houston Company Ltd. undertake to supply complete locomotives for operation on the overhead, third rail or battery systems, and their wide experience in the Electric Railway Field is at the disposal of prospective clients.

B.T.H. Electric Locomotive shunting coal on a grade of 1 in 30 at the Avon Power Station siding

The British Thomson-Houston Co. Ltd.

Electrical Engineers and Manufacturers

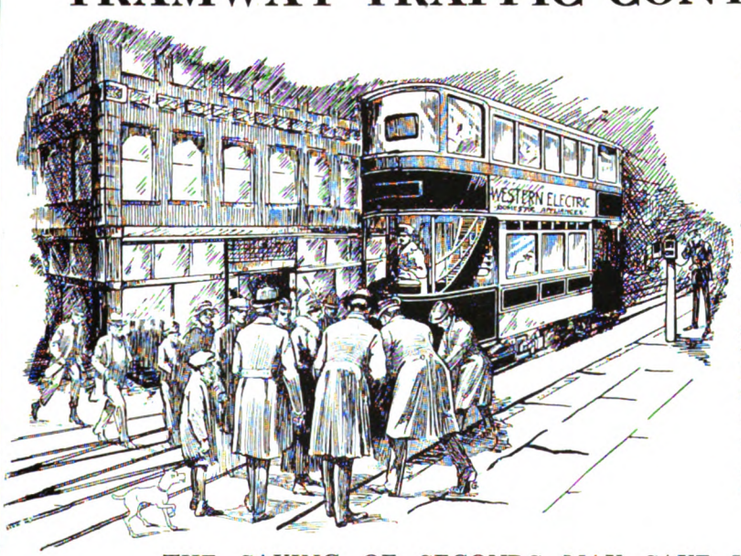
Head Office and Works :: :: :: RUGBY, England

B T-H

The Electrical Hall-Mark for Quality

Western Electric

TRAMWAY TRAFFIC CONTROL APPARATUS



ACCIDENT ANNOUNCEMENTS

—TELEPHONE DESPATCHING—

Instruction in telephoning is now becoming a feature of training in the duty of a Regulator.

This is an ackowledgment of the fact that the telephone counts for something in Tramway Operations, especially in case of accidents.

But why should your men always have to go to a public Call Box, then ask for your Number, wait—sometimes many minutes—for a disengaged Line; then tell their story? Perhaps there is not a public Call Box in the vicinity—all of these delays are dangerous, to say the least.

When with telephone despatching in use, the opening of a box and picking up a hand set puts them in direct touch with headquarters.

THE SAVING OF SECONDS MAY SAVE LIVES, ANXIETY, MONEY

This is only one of the many ways that Telephone Despatching will help in supervising your traffic

USE THE TELEPHONE ON YOUR ROAD AS IN YOUR OFFICE

Agents for India JOSTS ENG. CO. LTD. Apollo Street Bombay

Western Electric Company Limited.

WORKS—N. WOOLWICH E.16

Sydney Johannesburg

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THERE IS NOTHING LIKE Phono-Electric TROLLEY WIRE

Made by the Bridgeport Brass Company.

THE EQUIPMENT & ENGINEERING CO.

2 & 3 Norfolk Street, Strand,

LONDON W.C.2.

Works—HOLLOWAY

Telephone : **City 1088 (2 lines)**

Telegrams : **"Kharparts, Estrand, London"**

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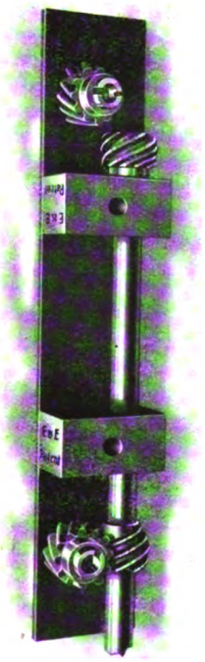
?HAVE YOU SEEN?

THE NEW E & E SPIRAL INDICATOR DRIVING MECHANISM

(PATENTED)

IT IS THE LAST WORD IN INDICATOR OPERATION AND MEETS A LONG-FELT NEED

FOR TRAMCARS OR MOTOR OMNIBUSES



ADVANTAGES

(1) There is **NO CHANGE-DIRECTION** clutch or device of any kind. The blind is **SIMPLY** driven in one direction or the other according to the operation of the handle. You do not have to push or pull or perform other motion than simply turn.

(2) **SIMPLICITY.** See illustration. Just an operating rod, with pinions fixed directly upon same, and blind operating pinions. Nothing to get out of order.

(3) **SMOOTH OPERATION.** Machine-cut helical gear pinions giving perfectly even drive.

(4) **DETACHABLE ROLLERS** which, together with blind, can be taken out of indicator in an instant without the use of any tools, leaving the gearing intact in the case.

(5) **INTERCHANGEABILITY.** Standardisation of manufacture, making all parts interchangeable. Gearings can also be altered from right hand to left hand operation in a few minutes.

ARRANGED FOR VERTICAL, BACK OR END OPERATION

As supplied to the London General Omnibus Co. Ltd., Plymouth Corporation, and many others.

THE EQUIPMENT & ENGINEERING CO.

2 & 3 Norfolk Street, Strand,

Telephone **City 1088 (2 lines)**

LONDON, W.C.2.

Telegrams **"Kharparts, Estrand, London"**

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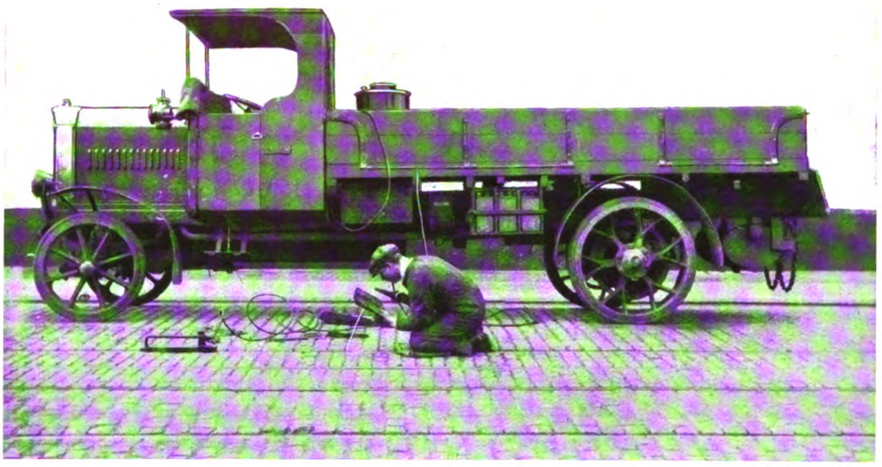
P.S.V. Ltd

Permanent Way—Renovation
BY
ELECTRIC WELDING



A Municipal Tramways Manager and User of the

STEVENS PETROL-ELECTRIC CHASSIS

writes in a Report to his Tramways Committee—

"The rails are rather badly worn, but during the last few months, I have been experimenting with them by welding up the rail surface at the Dicker joints. This welding has been successful, so much so that I would hesitate to recommend the renewal of these rails at present. I have been able practically to eliminate the joint, and have filled up the worn portion with new metal, deposited by the electric welding plant; the joints being renewed, the rails become of considerable value, and I therefore recommend that these rails be bonded."

SEND US YOUR ENQUIRIES FOR A STEVENS VEHICLE FOR WELDING YOUR TRACK

STEVENS PETROL-ELECTRIC VEHICLES LTD.

(Managing Director, W. A. STEVENS)

68 VICTORIA STREET, LONDON S.W.1

Telegrams
"STEMOBILE—SOWEST—LONDON"

Telephone
VICTORIA 1563

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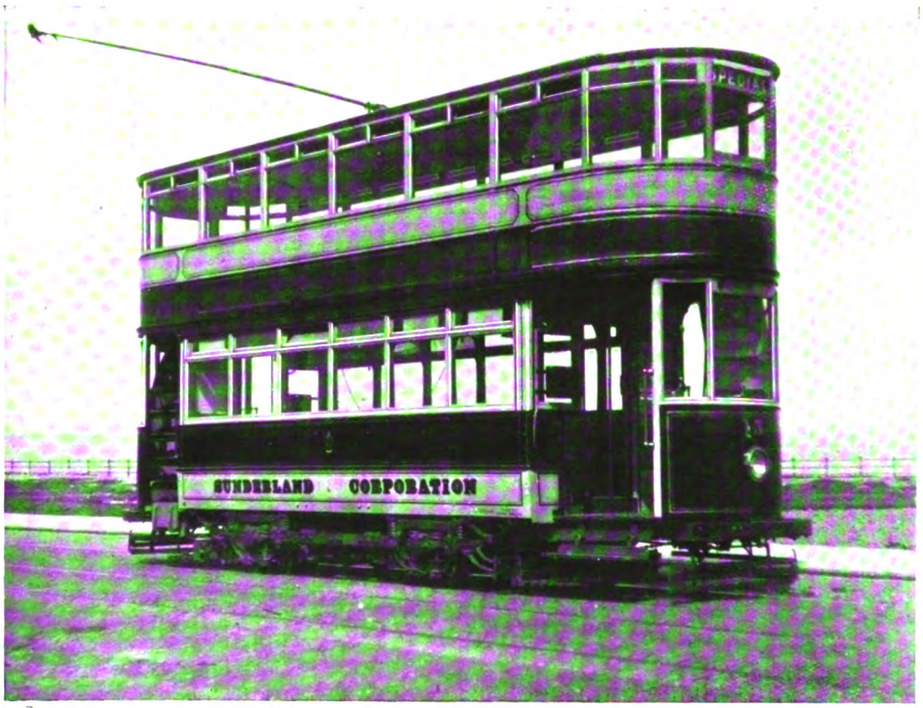
An interesting conversion

EIGHT wheels and four axles are frequently used to carry a car when a suitable single truck would do the work more efficiently.

The double-deck car shown is an example. The old maximum traction trucks were displaced and a Brill Radiax Truck substituted. The change was simplicity itself. The result has been to change a notoriously noisy and hard-riding car into a vehicle that rides with surprising ease, comfort and quietness. Short curves are negotiated smoothly and quietly. Sections of bad track and non-aligned rails have demonstrated the flexibility of the truck, to the benefit of the body and passengers.

The continual loss of 25% traction with the bogie has been eliminated. 100% traction on the four wheels has been secured. Upkeep on four idle wheels and two axles has been abolished, together with its brakegear, bearing &c. Wheel-slip is eliminated—current consumption diminished — quicker acceleration secured.

A radial truck has its true function in carrying a long body, normally carried by bogies. Worn-out maximum-traction trucks show cash losses due to an excessive repair bill. When these exceed the interest on capital outlay to buy new trucks, such purchase is justified on economic grounds.



THE J. G. BRILL COMPANY
150 Southampton Row LONDON W C 1
'Phone MUSEUM 5313 *Telegrams* "AXLES LONDON"

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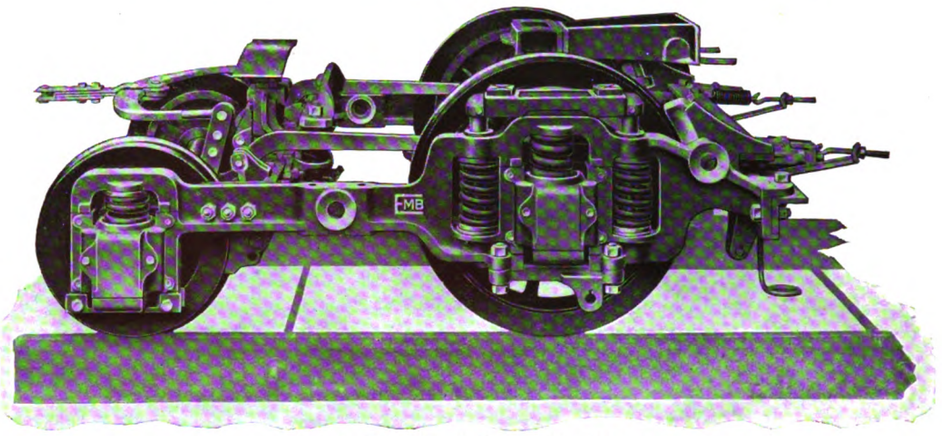
"Burnley" Max. Traction Truck

(With important new features by the E.M.B. Co. Ltd.)

Complete with "Maley" Electro-Mechanical Track Brake



As supplied to The South Lancashire Tramways Co.

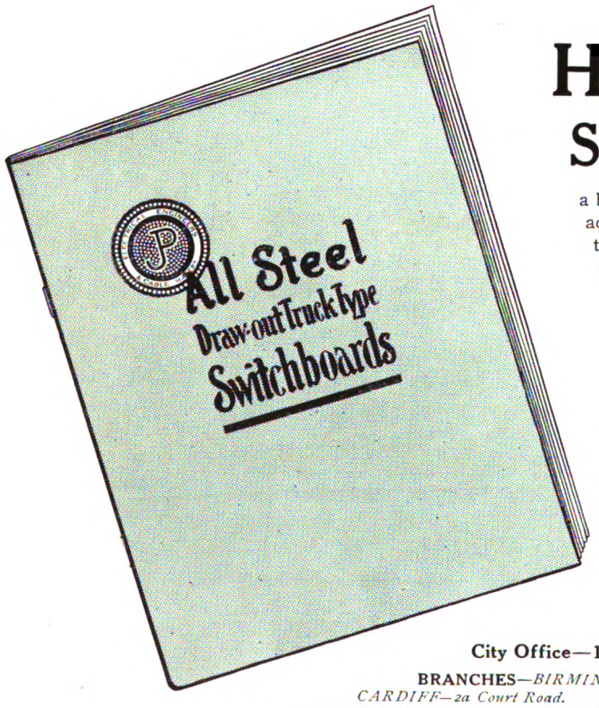
This Truck is unequalled for smooth running, absence of rolling, quick acceleration and deceleration, and the maintenance cost is unusually low.

Acceleration (up to 1 in 12 gradient) - As on 4-Wheel Trucks.

Braking (on any gradient) - - - As on 4-Wheel Trucks.

The Electro Mechanical Brake Co. Ltd.

West Bromwich England Established 1908



Here's our latest
Switchboard Catalogue

a book which deals comprehensively with the merits and advantages of the Truck Type Switchboard, and illustrates a number of excellent examples of this "space-saving" and "safety-insuring" gear.

In the matter of space it cuts out all necessity for a passage at the rear and safety is insured by the one simple fact that when inspection or adjustment is required a truck must be withdrawn and when withdrawn all otherwise "live" parts are automatically rendered "dead."

From its installation therefore two valuable advantages accrue and if you are interested (as you must be) we suggest you write for copy of the Booklet illustrated.

JOHNSON & PHILLIPS LTD

Electrical Engineers & Cable Makers since '75

Charlton London SE7

City Office—12 UNION COURT OLD BROAD STREET EC2

BRANCHES—*BIRMINGHAM—224 Corporation Street. BRISTOL—1 Nelson Street. CARDIFF—2a Court Road. GLASGOW—150 West George Street. MANCHESTER—251 Deansgate. NEWCASTLE-ON-TYNE—44b Blackett Street. PORTSMOUTH—Cleveland Road, Gosport. AUSTRALIA—212 Clarence Street, SYDNEY.*

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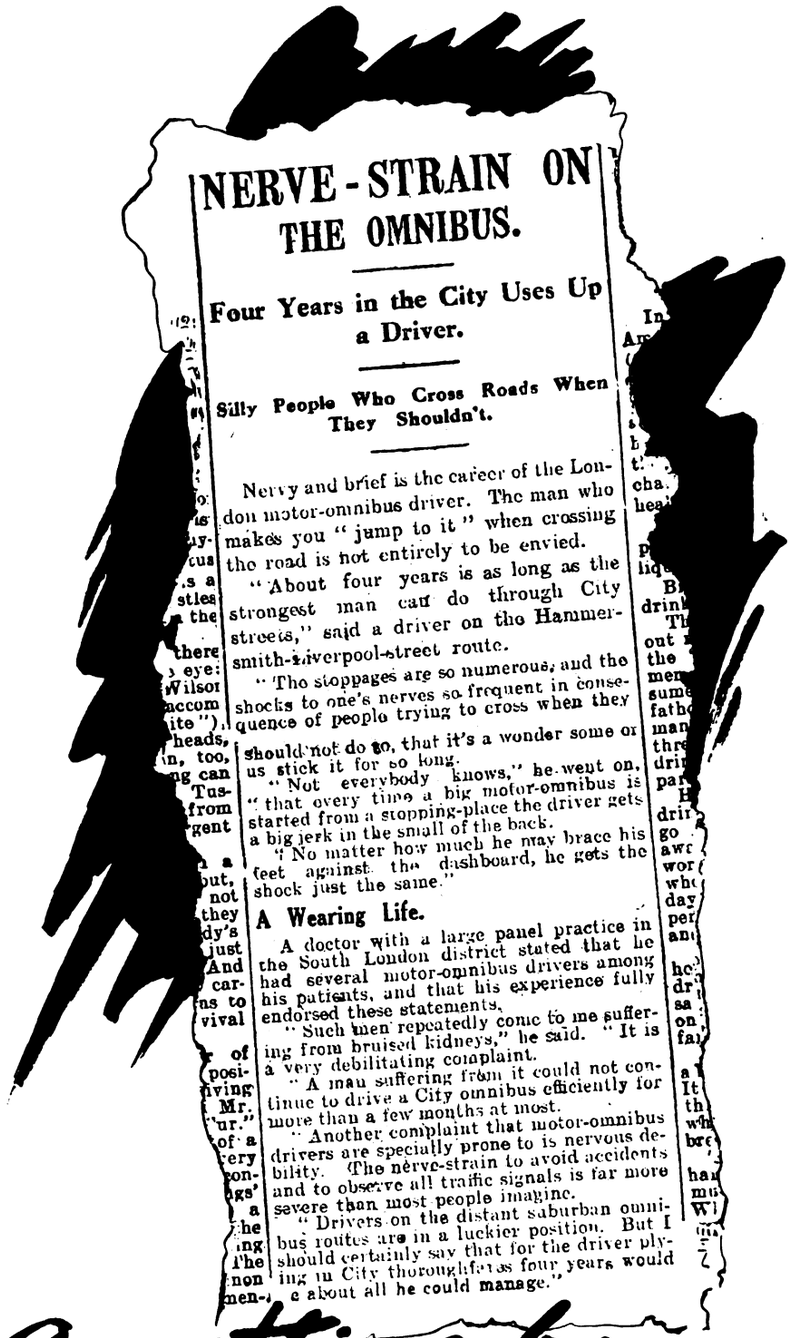

NERVE-STRAIN ON THE OMNIBUS.

Four Years in the City Uses Up a Driver.

Silly People Who Cross Roads When They Shouldn't.

Nervy and brief is the career of the London motor-omnibus driver. The man who makes you "jump to it" when crossing the road is not entirely to be envied.

"About four years is as long as the strongest man can do through City streets," said a driver on the Hammersmith-Liverpool-street route.

"The stoppages are so numerous, and the shocks to one's nerves so frequent in consequence of people trying to cross when they should not do so, that it's a wonder some of us stick it for so long.

"Not everybody knows," he went on, "that every time a big motor-omnibus is started from a stopping-place the driver gets a big jerk in the small of the back.

"No matter how much he may brace his feet against the dashboard, he gets the shock just the same."

A Wearing Life.

A doctor with a large panel practice in the South London district stated that he had several motor-omnibus drivers among his patients, and that his experience fully endorsed these statements.

"Such men repeatedly come to me suffering from bruised kidneys," he said. "It is a very debilitating complaint.

"A man suffering from it could not continue to drive a City omnibus efficiently for more than a few months at most.

"Another complaint that motor-omnibus drivers are specially prone to is nervous debility. The nerve-strain to avoid accidents and to observe all traffic signals is far more severe than most people imagine.

"Drivers on the distant suburban omnibus routes are in a luckier position. But I should certainly say that for the driver plying in City thoroughfares four years would be about all he could manage."

A cutting from the London Evening News.

WHILST we hasten to point out that this article was not prompted by us, we think that the moral it points is well worth the consideration of Omnibus Companies and Municipal Bodies, and we think the following notes by an impartial observer will interest them.

Happening a day or so ago to mention the matter of strain on 'bus drivers, I was treated in return to some very pertinent remarks concerning up-to-date methods of vehicle propulsion, by a man who told me that he had been driving 'buses for the last 15 years.

"Ah! you've been reading the newspaper article that says a driver's 'worn out' in five years. But that's only when they are driving one of the old gear and clutch 'buses. I used to drive one—I felt the strain in those days; the continuous grinding of 'changing' and 'letting in and throwing out' played havoc with the nerves."

"You don't look much the worse for it," I remarked.

"No! but I haven't changed a gear or touched a clutch since 1911. I've been working on a Petrol-Electric 'bus since then."

And he proceeded to tell me of his firm, who employ some 370 drivers, all driving Petrol-Electric 'buses or char-a-bancs—and the average yearly "sick leave" of each man is *less than a week*. He himself had driven through the City and inner suburbs for some years—one route necessitated the crossing of Tower Bridge six times a day—and had never felt any ill-effects from the strain. The inner suburbs (for instance, the Walworth Road) he characterised as being more difficult to negotiate than the City, where there are fewer children and better police control. Yet he had run through them for years without ever having an accident or feeling any the worse for his experience.

Somewhat surprised, I asked what exactly were the virtues of these Petrol-Electrics; and from what I was told I gathered that the principle is this—

A petrol engine of the usual type is used to drive a dynamo which supplies electricity for the motor, which, in turn, drives the rear wheels. There is no mechanical connection between the engine and back axle—and no gears.

Varying road conditions are accommodated simply by the operation of a field regulation lever, fitted on the steering column. This lever and the throttle pedal are all that is necessary for controlling all speeds.

Control being so eminently simple, the driver is able to give all his attention to the road in front of him. And the absence of gears and clutch naturally removes all the jolts and jerks associated with the changing of these. Hence the good health of Petrol-Electric drivers.

Full details of the Petrol-Electric system may be obtained from

TILLING-STEVENS MOTORS LTD.——MAIDSTONE

London Offices—**26 VICTORIA STREET SW1**

TILLING-STEVENS PETROL-ELECTRIC

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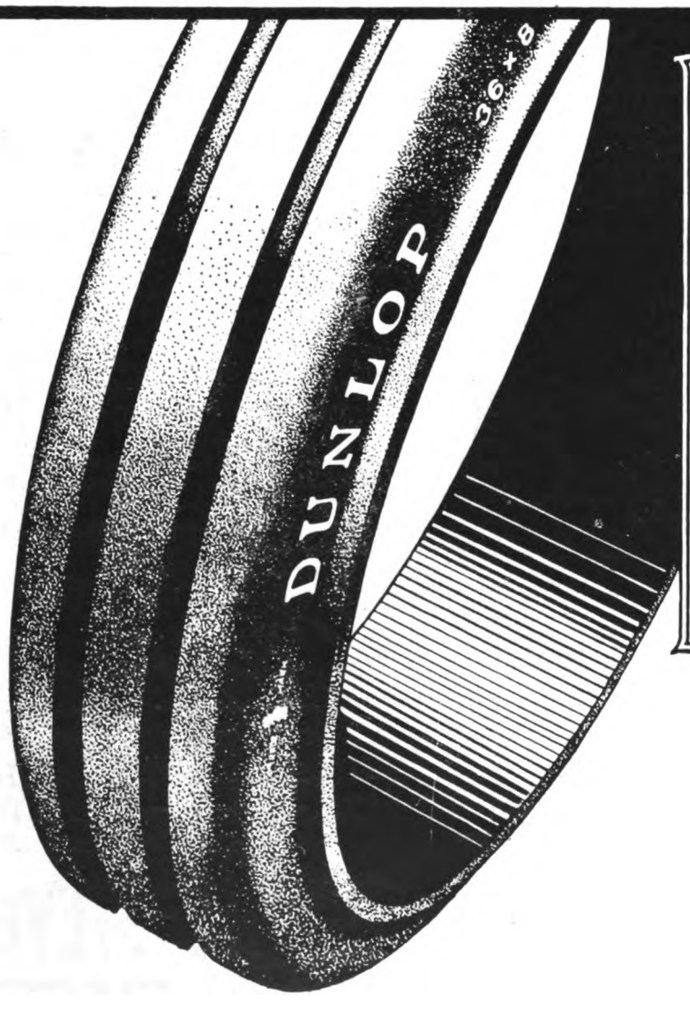
Fit 'Giant Singles'

—and why!



NO. 1. WHAT IT IS

The
DUNLOP
'Giant Single

Is intended as an alternative equipment to twin tyres on rear wheels, over which it possesses numerous advantages.

In each successive announcement relative to this type we shall give one or more conclusive reasons why the 'Giant Single' must interest every owner of heavy commercial vehicles.

In this, the first, we will content ourselves with one brief statement:

They give more mileage at less cost-per-ton-mile.

No alteration required to wheels of British Standard Diameter.

TRADE MARK

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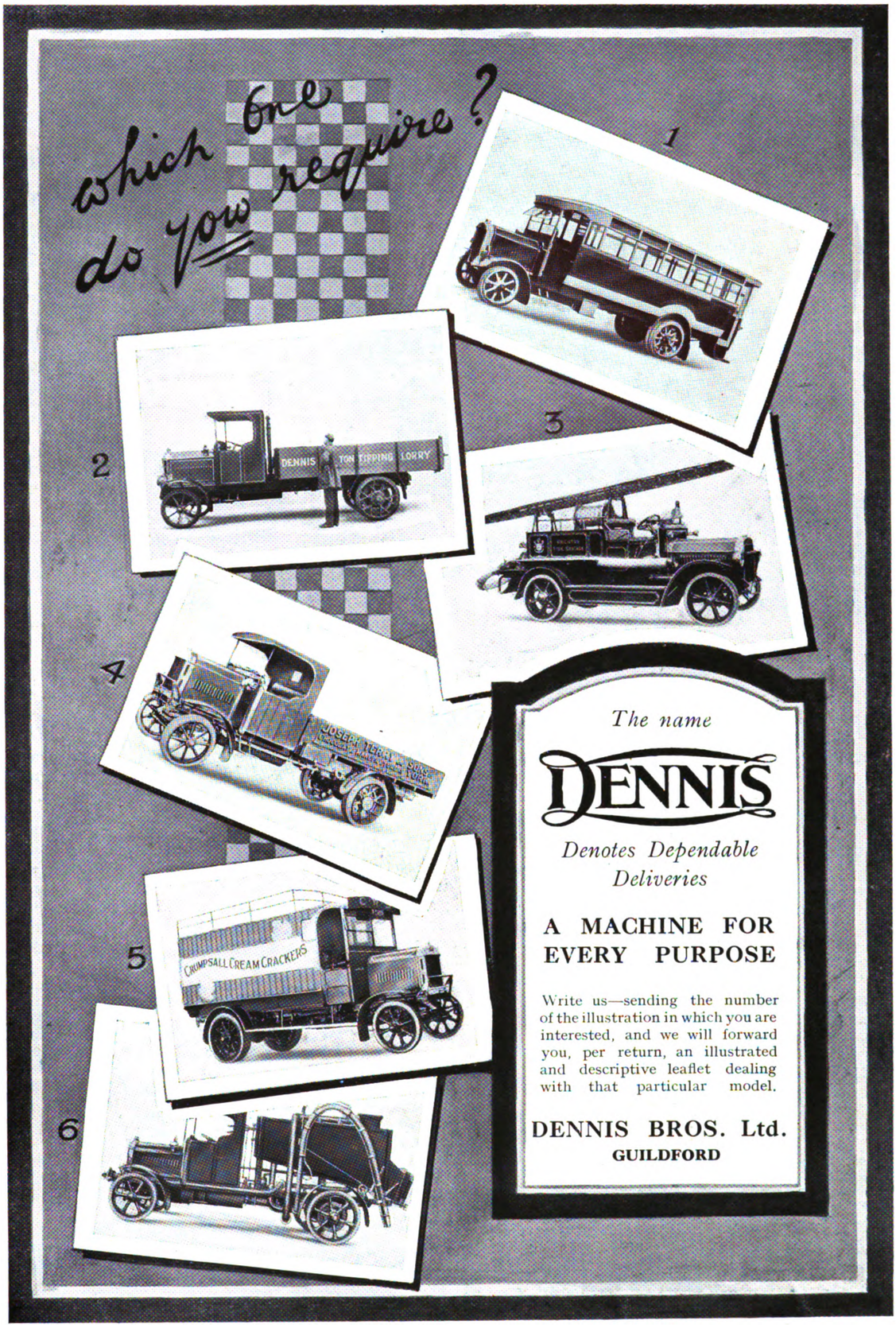

The name

DENNIS

Denotes Dependable Deliveries

A MACHINE FOR EVERY PURPOSE

Write us—sending the number of the illustration in which you are interested, and we will forward you, per return, an illustrated and descriptive leaflet dealing with that particular model.

DENNIS BROS. Ltd.
GUILDFORD

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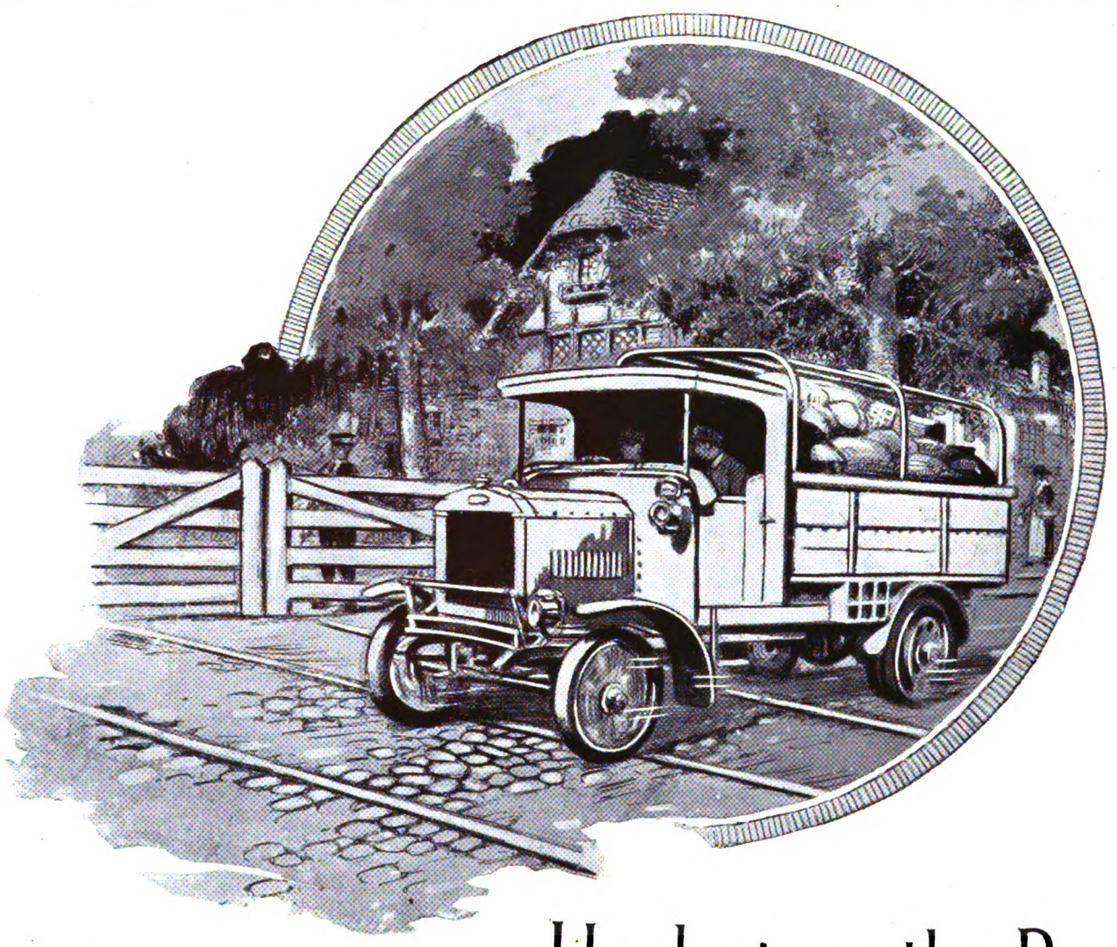


[No. 1]

Henley's on the Road

Blythe Road, Hayes,
July 1921.

Messrs. Henley's Tyre and Rubber Co. Ltd.

Dear Sirs,

With reference to the Henley Tyres fitted on our Foden Steam Wagon M6918, these were fitted in May 1920, and have since covered a distance of 19,500 miles. The hind tyres have been renewed but the fronts look capable of doing a like distance again. This lorry has been used with, and without, a trailer and a considerable amount of its work has been between London and Manchester.

Yours faithfully,
MYLON BROTHERS,
Haulage Contractors.

A LEVEL-CROSSING paved with cobbles is as severe a piece of ground as a driver is likely to meet in any day's run. Woe betide him if his tyres are not sound; a surface so uneven as this will knock his engine to pieces in a few weeks and play havoc with his loads. The springs can't take all the jolts and jars. They want help—help that only good tyres can supply.

Good tyres lessen road shocks; they spare the springs, the engine and the load.

To be on the safe side, recommend that lorries be fitted with

HENLEY

SOLID RUBBER BAND TYRES

Write for particulars and list of Press Owners:

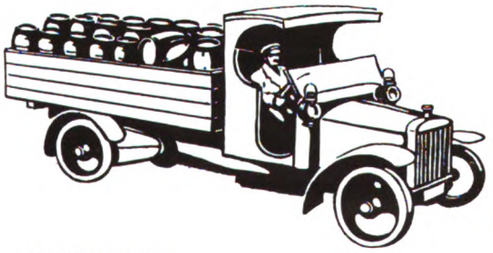
Henley's Tyre & Rubber Co. Ltd.

20-22 CHRISTOPHER ST., FINSBURY SQUARE, LONDON, E.C.2.

Depots at Birmingham, Glasgow, Edinburgh, Bristol, Manchester, Liverpool, Newcastle-on-Tyne, Leeds.

Telegrams—"Hetewocol, Finsquare, London." *Telephone*—London Wall 3886 and 5394.

Why not use a "WHY NOT," the longest-driving Golf Ball on the market?



None better than HENLEY'S for heavy vehicles

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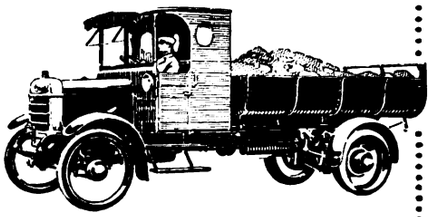
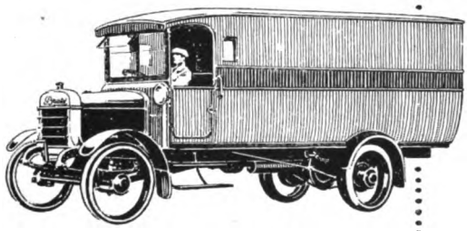
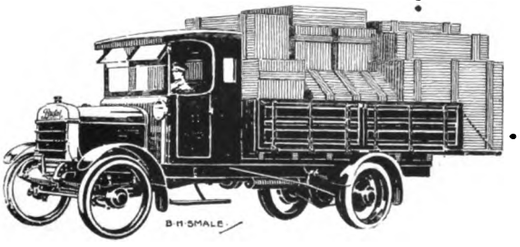
For long service







"Bristol"

COMMERCIAL VEHICLES

OF simple design and great strength for continuous heavy service—at low running cost and maintenance.

They have gained unsolicited praise from every owner, by their complete embodiment of all essentials ensuring

RELIABILITY, DURABILITY & ECONOMY

The 40 H.P. Engines manufactured throughout in the Company's Works, provide an additional guarantee for the absolute efficiency of 'BRISTOL' vehicles.

• • •

28-Seater Char-a-bancs.
29-Seater special type Saloon Buses.
Hydraulic Tipping Wagons to carry 4 tons.
3 and 4 ton Vans.
3 and 4 ton Lorries.

Demonstrations arranged. *Catalogues on request.*

THE BRISTOL TRAMWAYS AND CARRIAGE Co. LTD BRISTOL

Telephone. BRISTOL 4260. *Telegrams*. AUTOMOBILE BRISTOL.

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AVON
BAND TYRES

The BRITISH Solid Tyre of outstanding merit—

—gives best results where roads are worst.

LOWER PRICES IN FORCE

A further reduction in the price of Avon Solids—the second this year—brings the cost down another 10%, or well below the pre-war level. The quality remains always the same—the highest possible—and the slogan "longest *effective* life at lowest cost per mile" is more than ever true of this entirely BRITISH tyre.

¶ Owners of fleets should write to the nearest Avon Depot for the new Price List S.T. 13, stating the number of their vehicles.

Traders should write for particulars of the attractive Avon contract terms.

The AVON INDIA RUBBER CO Ltd
343-5 Euston Road, London N W 1
Works (Est. 1885)—Melksham, Wilts, and Bradford-on-Avon, Wilts.
Stock and Service Depots at Manchester, Glasgow, Bristol, Birmingham, Leeds, Newcastle, Liverpool, Nottingham, Swansea, Aberdeen, Cardiff, Plymouth, Dublin, Belfast.

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CHRISTOPHER DODSON Ltd

Passenger Body Specialists

The outstanding feature of the Commercial Vehicle Exhibition was

Our New Model "Charabus" Body

The "CHARABUS" is designed to comprise all the essential and desirable features of both Single Deck Saloon Bus and Char-a-Banc in one Car. Open or Closed in a few minutes. Can be used all the year round. Motor coach in Summer. Service Bus in Winter. Daylight riding as Char-a-banc, return at night in a comfortable, well illuminated Bus. Easy access to all seats. Provision for luggage Seating Capacity—Up to 42 Passengers.

Our Well-known C.D. 19 Model —— Single Deck Bus Body ——

Is in constant production for all leading makes of omnibus chassis, and quick delivery can consequently be given.

Double Deck Bus Bodies for London or Provinces

Specifications and Quotations sent upon application

Head Office and Works

Cobbold Road, Willesden, London NW10

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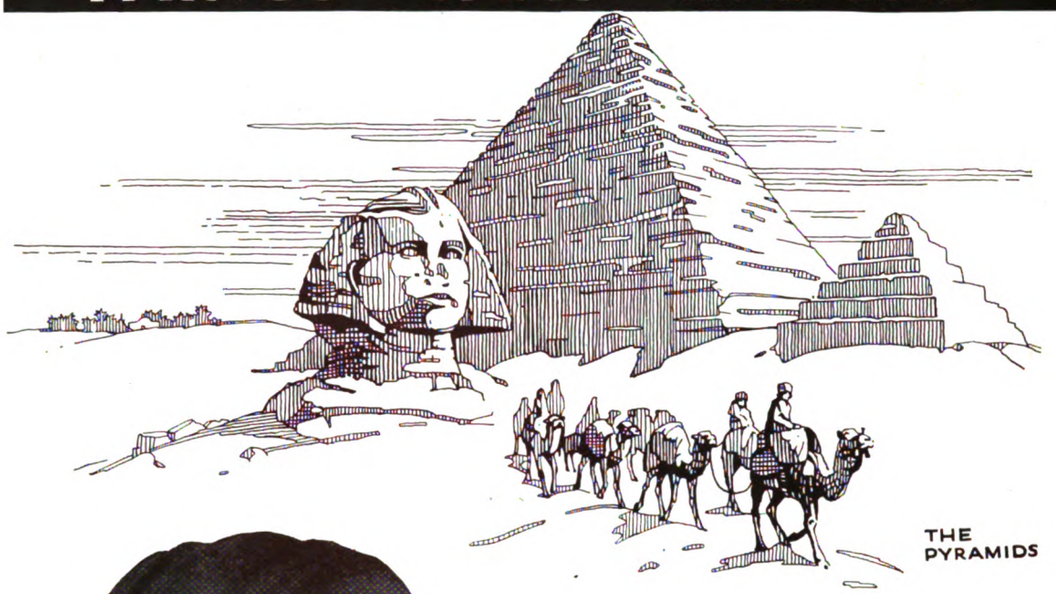
THINGS THAT ENDURE



THE PYRAMIDS

Reduced Prices now in operation — apply for quotations

Bates SOLID TYRES

Try a Pair First
—and Watch the Result!

Write for interesting Leaflet

W. & A. BATES LTD

(Rubber Manufacturers since 1863)

St. Mary's Mills, Leicester

London—28 St. John Sq., Clerkenwell Rd.

Manchester - St. Mary's Buildings, Quay Street, Deansgate
Glasgow - - - 24 Carlton Place
Belfast - - - 17—19 Waring Street
Bristol - - - - 63 Victoria Street
Newcastle - - 28 Clayton Street, W.

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Standard "Edinburgh" type 'bus fitted with 36-40 h.p. motor.

This is one of 40 machines supplied to Barnsley and District Traction Co. Ltd.

A popular machine to carry 33 passengers —at present in service in South Wales.

MOTORBUS or TRAMCAR?

THEIR RELATIVE RENEWAL COSTS

THE cost of extending or renewing tramway tracks and equipment is well-nigh prohibitive these days.

The Motorbus is the economical alternative.

The LEYLAND is the Motorbus.

A great number of very profitable undertakings in the country have standardised solely on Leyland vehicles—and have never regretted it.

See the latest literature on Leyland Motorbuses obtainable from any of our Depots or Agents.

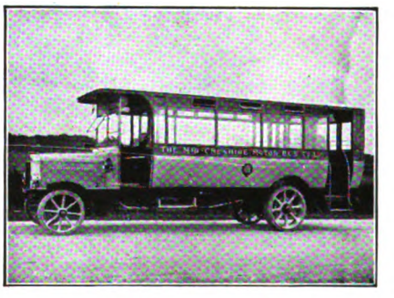
By Royal Appointment

Leyland

By Royal Appointment

A specially designed rear entrance 'bus built for the Birkenhead Corporation.

Illustrates the rear interior of the "Edinburgh" type single-decker.



One of seven machines as supplied to the Mid-Cheshire Motor Omnibus Company.

LEYLAND MOTORS LIMITED, LEYLAND, LANCS.

London Office and Overseas Department—47 New Kent Road, S.E.1. Branches at Ham, Chorley, Farington, Glasgow, Manchester, Liverpool, Bristol, Southampton, Sydney, Wellington (N.Z.), Cape Town, Toronto &c.

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THE

HICKMAN BODY BUILDING CO LTD

Specialists in

LIGHT-WEIGHT OMNIBUSES AND COMMERCIAL VEHICLE BODIES

8 Grove Rd. Balham High Rd. SW12

64-Seater supplied to Messrs. Barton of Nottingham
(Seventh Repeat Order)

The special form of construction in the **Hickman Light-weight Bodies** ensures—

Lightness with Safety

Large Seating Capacity with Comfort

Low Cost with Durability

Designs registered and construction patented

NOTE CHANGE OF ADDRESS

Mr. HICKMAN, having severed his connection with the **GENERAL SEATING COMPANY,** is now trading as above, and is in a position to give quick delivery of either single or double-deck omnibuses constructed on his patent principle.

An Original Constructional Scheme from the Dash to the Rear Step

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THE FAMOUS

Straker-Squire

1922 Model "A" type Chassis
has proved itself to be the ideal Chassis

FOR

CHARS-A-BANCS, MOTOR 'BUSES & MOTOR LORRIES FOR EVERY FORM OF TRANSPORT

The following letter is representative of the general opinion held by users of the Straker-Squire Chassis—

"I may say the Straker-Squire Char-a-banc which we purchased last year has run exceedingly well, having done about 5000 miles this year, and also the two heavy motor lorries which we got from you have given every satisfaction."

Prices and complete specifications from

STRAKER-SQUIRE LTD. Edmonton, London, N.18

Telephone—TOTTENHAM 2393 *Telegrams—"RHOMBOIDAL TOTTLANE LONDON"*

St. James's 33

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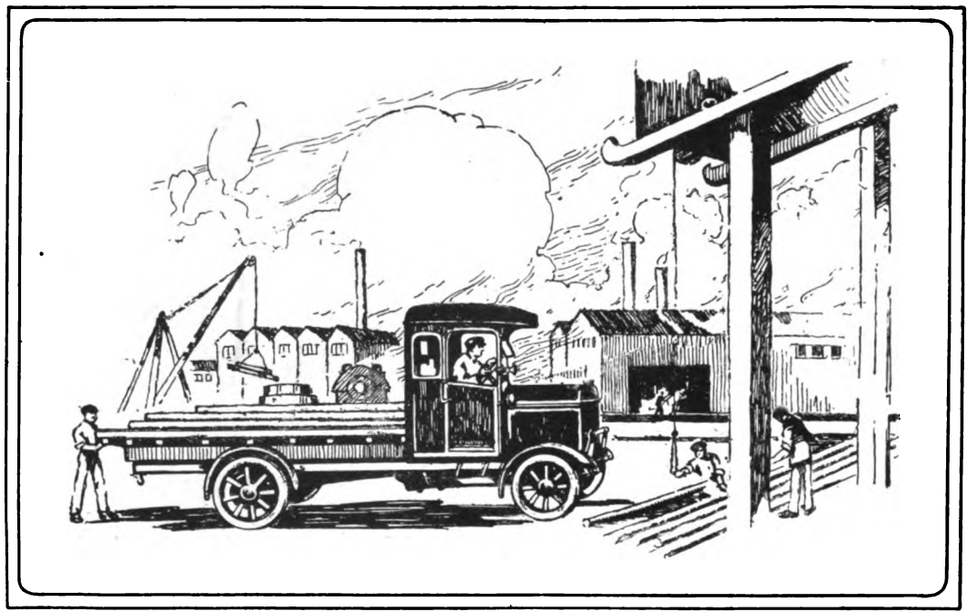
Page 4 *The Shrewsbury-Challiner Service*



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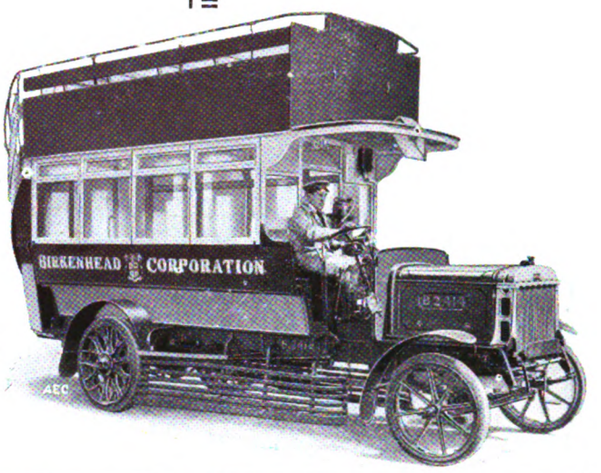

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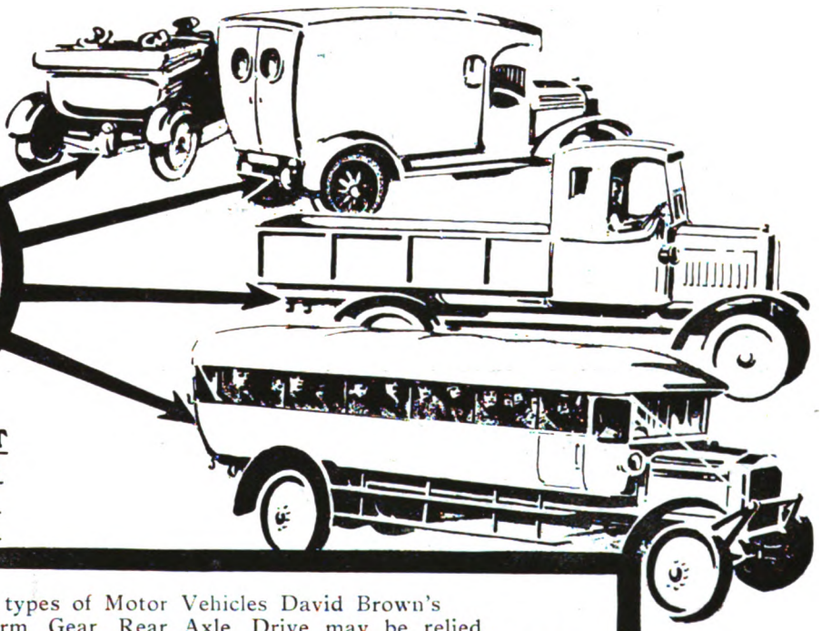

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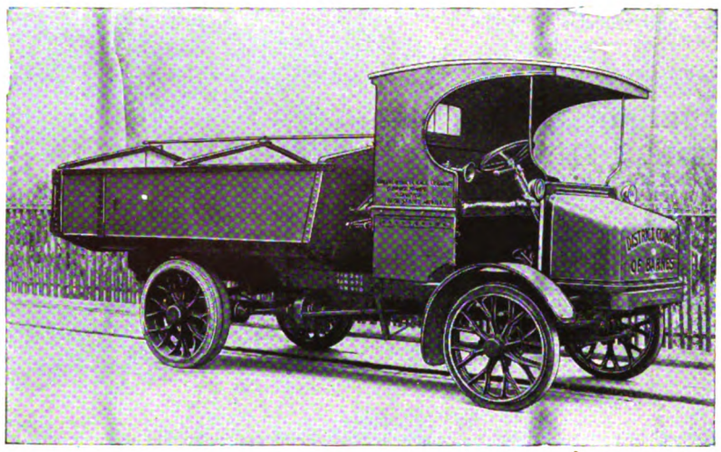

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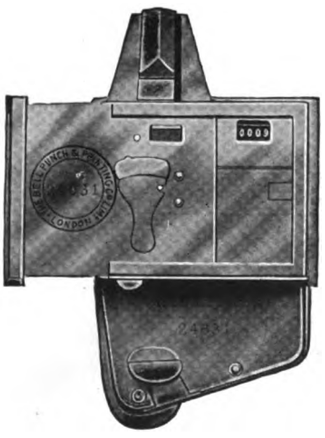

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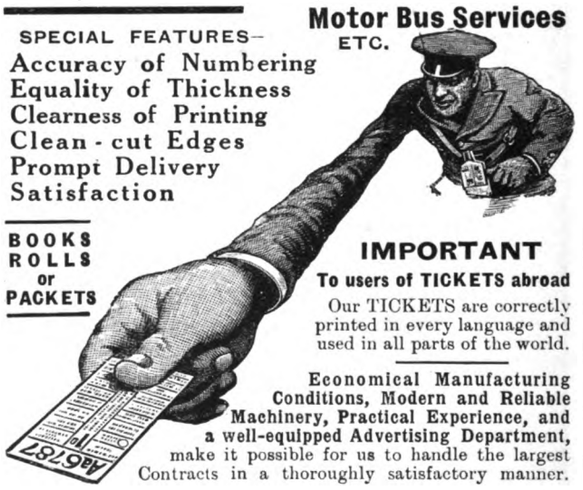

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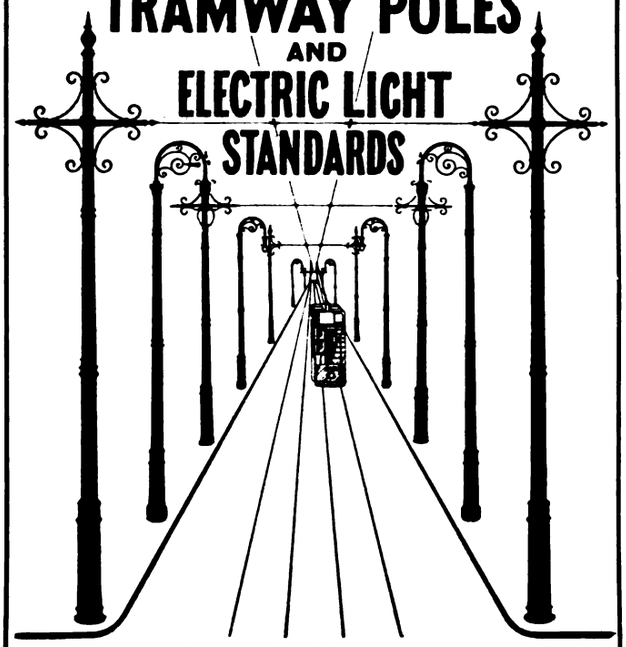

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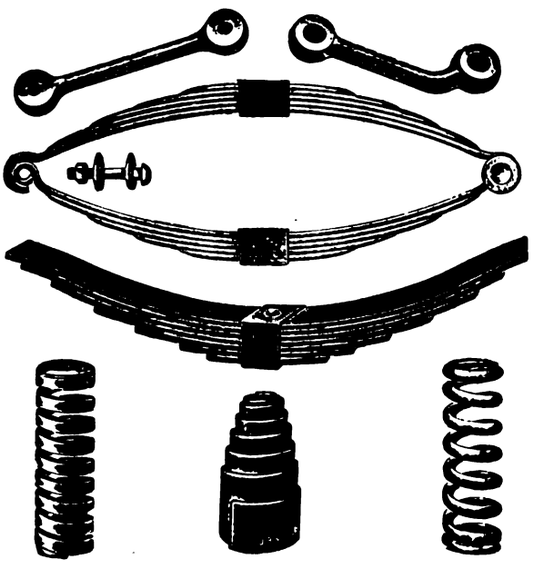

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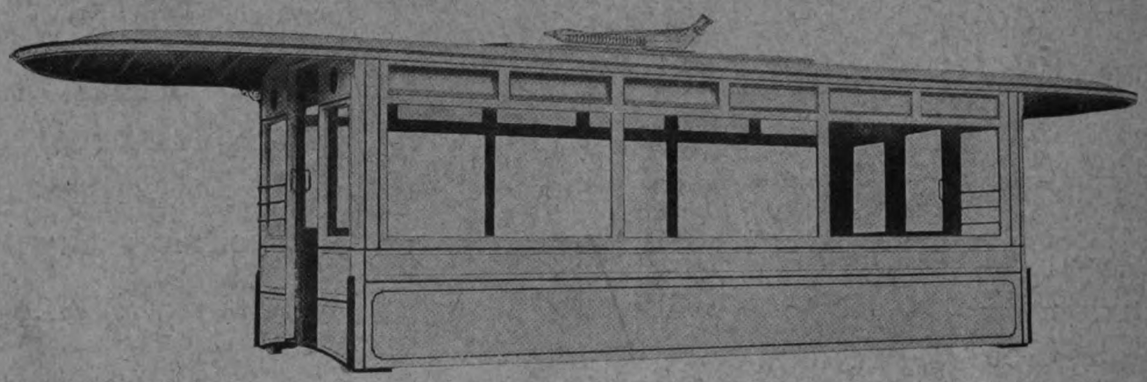

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